THE WEATHER AND CIRCULATION OF JANUARY 1956 [1]

A Month With a Record Low Index

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1. FIVE-DAY MEAN CIRCULATION

In the preceding three articles of this series [1, 2, 3] the unusual behavior of the zonal index during the past three months has been noted. Five-day mean values of this index, which expresses the average strength of the prevailing westerlies between latitudes 35° and 55° N. in the Western Hemisphere, are plotted in figure 1 for both 700 mb. (above) and sea level (below). After undergoing an unprecedented double cycle in October 1955 [1], the index failed to rise above normal during any 5-day period from October 28 to February 22, the longest period of continuous low index ever observed. However, normal values were reached briefly, at 700 mb. for the period ending December 25 and at sea level for the period ending February 5. These two dates mark the beginning and end of a pronounced index cycle which culminated with the lowest 5-day mean indices ever observed, from January 7–11 at 700 mb. and from January 11–15 at sea level (table 1). In order to extend the period of record back beyond January 1941, when computation of indices for the Western Hemisphere began, the 5-day mean indices for these two periods were recomputed for the entire Northern Hemisphere. They were then compared with the hemispheric indices computed by Willett [4] for each 5-day period during the six cold months of

[1] See Charts I–XV following p. 45 for analyzed climatological data for the month.

TABLE 1.—*Values of the temperate latitude (35°–55° N.) zonal index (m. p. s.)*

	Period	Western Hemisphere only		Entire Northern Hemisphere	
		700 mb.	Sea level	700 mb.	Sea level
5-day mean	Jan. 7-11, 1956	[a] 2.9	−3.0	[b] 3.9	[e] −2.2
5-day mean	Jan. 11-15, 1956	3.4	[a] −3.4	5.5	−2.1
30-day mean	Jan. 1956	6.6	[d] 0.0	[c] 6.9	−0.5
Normal	January	11.8	4.1	9.6	2.0
30-day anomaly	Jan. 1956	[f] −5.2	[f] −4.1	[e] −2.7	[g] −2.5

[a] Lowest index for any 5-day mean period of record (1/41–1/56).
[b] Lowest index for any 5-day mean period of record (10/32–3/39).
[c] Third lowest index for any 5-day mean period of record (10/32–3/39 and 1/41–1/42).
[d] Lowest index for any month of record (9/42–1/56).
[e] Comparable data not available.
[f] Greatest negative departure from normal for any month of record (9/42–1/56).
[g] Greatest negative departure from normal for any month of record (1/99–6/39 and 1/49–1/56).

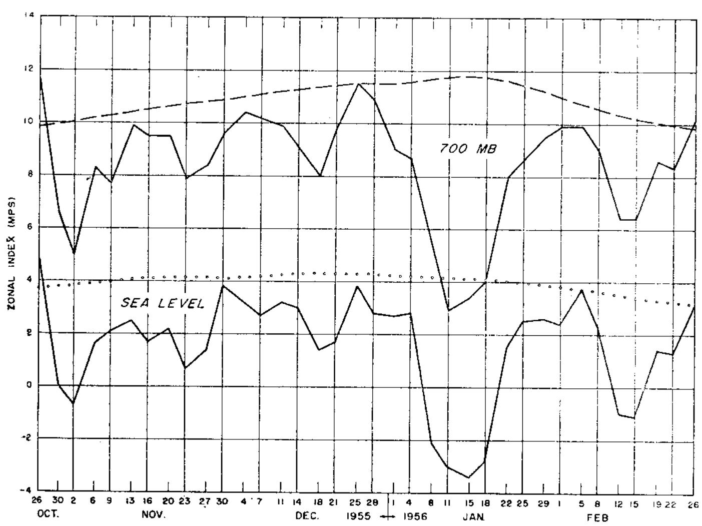

FIGURE 1.—Time variation of zonal index in meters per second for the Western Hemisphere in the latitude belt 35°–55° N. Solid lines connect 5-day mean values (plotted on the last day of the period) for 700 mb. (above) and sea level (below). Variation of normal zonal index is shown by dashed line for 700 mb. and dotted line for sea level. Note the prolonged period of low index (Oct. 28 to Feb. 22) and the marked index cycle from Dec. 25 to Feb 5.

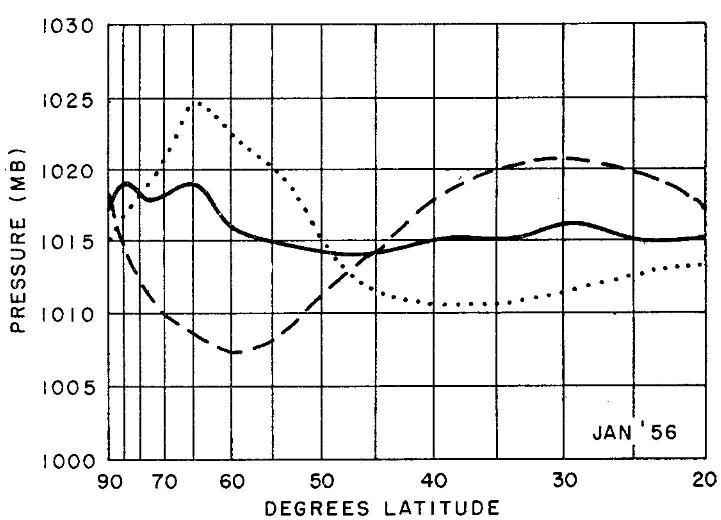

FIGURE 2.—Mean sea level pressure profiles in the Western Hemisphere for January 11–15, 1956 (dotted), month of January 1956 (solid) and January normal (dashed). Excess of pressure at high latitudes and deficit in the south were indicative of low zonal index during both 5- and 30-day periods.

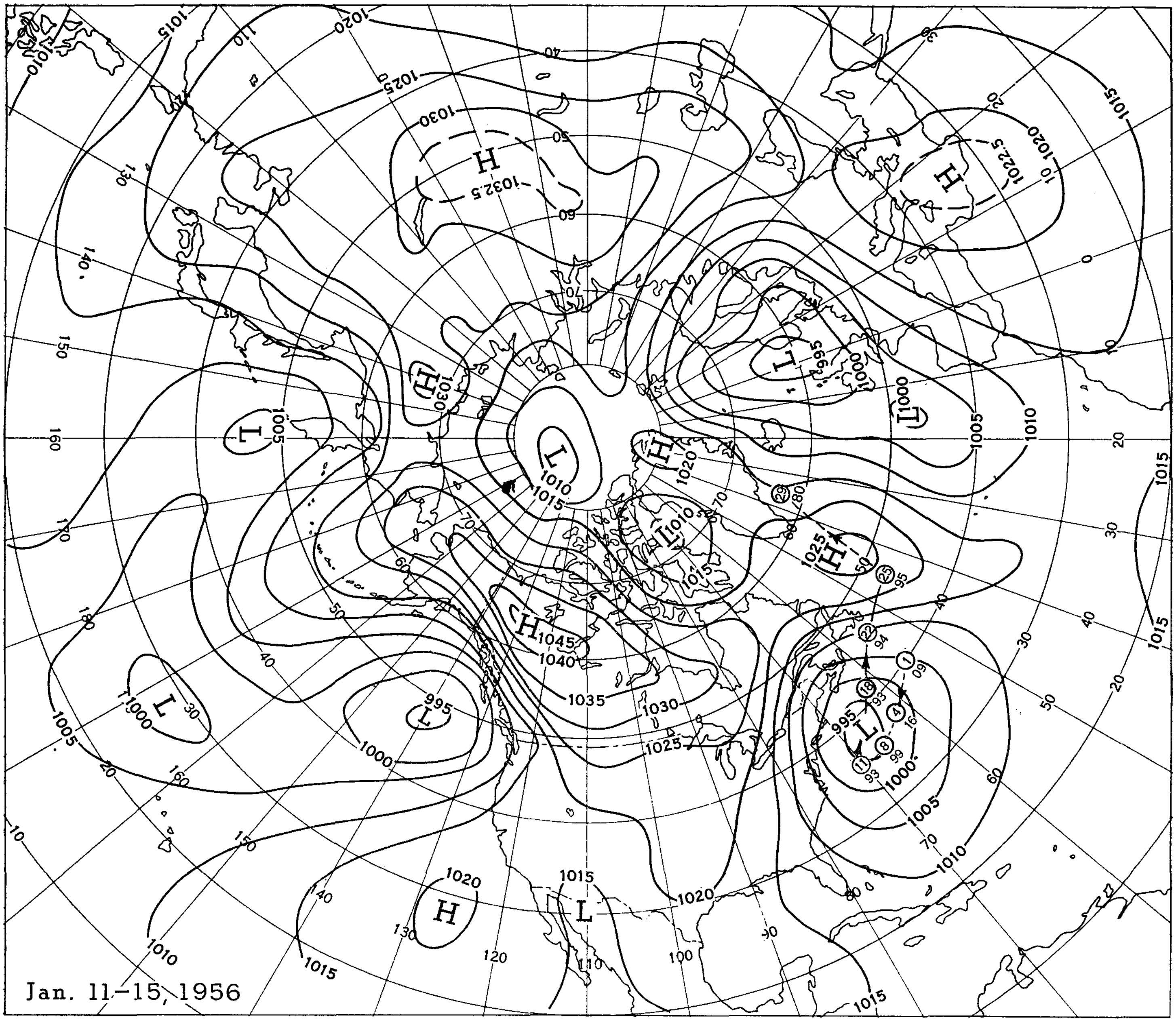

FIGURE 3.—Mean sea level pressure (in mb.) for the 5-day period of lowest zonal index, January 11–15, 1956. The track of the low center off the Middle Atlantic Coast on a series of 5-day mean charts during the month is given by the solid arrows, except dashed in regions of uncertain continuity. The number inside each open square is the last day of the 5-day period, and the number below is the intensity of the center in mb. (last two digits only).

the year from October 1932 through March 1939. The results, shown in table 1, indicate that the index for the total hemisphere was still at a record low level for 700 mb. and a near record at sea level.

In view of the extreme nature of these 5-day mean zonal indices, it is of considerable interest to examine other features of the circulation which accompanied them. The dotted line in figure 2 gives the sea level pressure profile for the Western Hemisphere during the period, January 11–15. A complete reversal from the normal January profile (dashed line) is at once apparent. Average pressures were well below normal at all latitudes from 20° to 45° N., but above normal from 50° to 80° N. In fact, easterlies instead of westerlies prevailed between 35° and 55° N., so that the sea level index was negative.

The 5-day mean isobars at sea level during the period January 11–15 are shown in figure 3. This map contains most of the features customarily associated with low zonal index [5, 6], including split Icelandic and Aleutian Lows, extensive polar anticyclones, weak subtropical Highs, and strong meridional circulation at middle latitudes. Between 35° and 55° N. westerlies were in evidence only in the areas of Europe and the eastern Pacific. In the remainder of the Northern Hemisphere mean winds were from the east in this latitude belt, with the easterlies strongest, and hence the local index lowest, in North America and the central Pacific.

One of the most important contributions to the low zonal index was made by the deep mean Low off the Middle Atlantic Coast of the United States. The location and central intensity of this center of action during each 5-day mean period of January have therefore been superimposed on figure 3. After originating south of the Maritime Provinces at the beginning of the month, the Low apparently moved slowly southwestward and deepened until January 11, then took a northeastward trajectory along the edge of the Gulf Stream until the 25th, and finally amalgamated with the Icelandic Low at the end of the month. Between January 7 and 17 this 5-day mean Low was composed essentially of only one daily cyclone whose trajectory is given in Chart X. It dominated the weather of the eastern United States for over a week, producing gales, high tides, snow, sleet, glaze, rain, and floods in the Northeast and damaging frost in the Southeast, especially in Florida. Further details about this severe quasi-stationary storm can be found in two interesting articles, one by Sable [7] and the other by McQueen and Keith [8].

The 700-mb. circulation was also characterized by marked abnormalities during the period of lowest zonal index at this level, January 7–11. The 5-day mean zonal wind speed profile for the Western Hemisphere, given by the dotted line in figure 4, reveals a minimum wind speed of only 0.5 meters per second between 40° and 45° N., the very latitudes where a westerly maximum of over 14 m. p. s. is normally present in January (dashed line). This marked deficit of wind speed at middle latitudes was associated with two large blocking Highs (around 48° N.), one in mid-Pacific and the other near Newfoundland (fig. 5). Each was accompanied by cut-off Lows to the southwest, difluent areas to the west, and deep troughs both up and downstream. Other typically low index features of figure 5 are the numerous low and high centers, the large amplitude of the waves, and the absence of the normal trough tilt from northeast to southwest.

The abnormalities of figure 5 are brought into sharp focus by the corresponding field of 700-mb. height departure from normal, shown in figure 6. The two blocking Highs were accompanied by the largest anomalies in the Northern Hemisphere, +1,370 feet on the Labrador coast and +1,150 feet in the central Aleutians. Heights at 700 mb. have been above normal in these two areas since the onset of the current spell of low index during the last week of October [1, 2, 3]. In fact, the persistent recurrence of above normal heights in the vicinity of Labrador and Davis Strait was one of the circulation highlights of the year 1955 [9]. The blocking nature of the positive anomalies over Labrador and the Aleutians

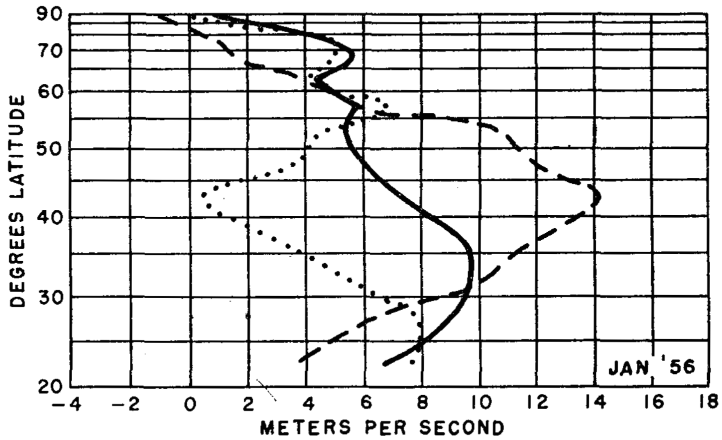

FIGURE 4.—Mean 700-mb. zonal wind speed profiles in the Western Hemisphere for January 7–11, 1956 (dotted), January 1956 (solid) and January normal (dashed). During both 5- and 30-day periods marked deficit of wind speed at middle latitudes was not fully compensated by small excess at low and high latitudes.

was accentuated by the presence (fig. 6) of pronounced negative anomalies to the south of each center. As a result, strong anomalous flow components from the east at middle latitudes extended from the eastern Atlantic to the Mississippi Valley and also across the central Pacific.

The two largest negative height anomalies in figure 6 were centered off the coasts of the Carolinas (−710 ft.) and Oregon (−570 ft.). The location and central intensity of these two centers on each 5-day mean 700-mb. height departure from normal map during January are plotted in figure 7. The trajectory of the negative center off the east coast was very similar to the track of the 5-day mean sea level Low reproduced in figure 3. Continuity was actually clearer in the former case, however, especially during the first week of the month. In terms of both sea level pressure and 700-mb. height anomaly, the center deepened as it moved southwestward, reaching maximum intensity at the minimum of the 700-mb. index cycle (Jan. 7–11). As the Low migrated northeastward during the remainder of the month, the intensity of its 700-mb. height departure from normal weakened steadily, but its sea level pressure remained sensibly constant.

Figure 7 also contains the tracks of the two largest centers of positive 700-mb. anomaly in figure 6. The magnitude of the Aleutian center increased from the 1st to the 11th of January and then diminished as it moved southward during the last 2 weeks of the month. The center over Labrador also attained its maximum intensity during the 5-day period of lowest 700-mb. index, January 7–11. It was actually formed by an amalgamation of two separate 5-day mean positive anomaly centers, one moving eastward across Canada and the other retrograding from mid-Atlantic. Although the central intensity of both centers increased as they approached Labrador, the intensity of the unified center (+1,370 ft.) was greater than expected from simple extrapolation. The motion

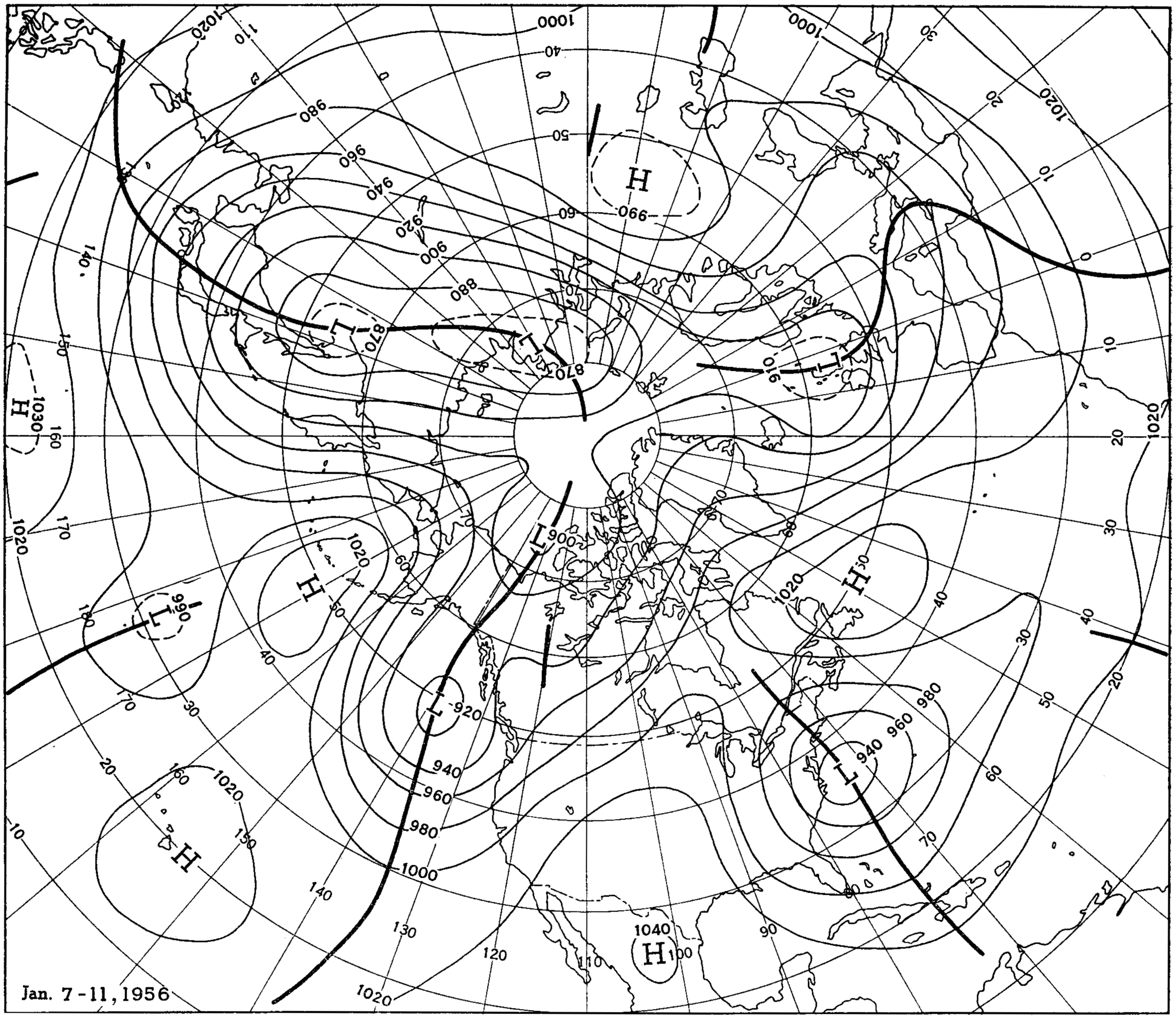

FIGURE 5.—Mean 700-mb. height (in tens of feet) for the 5-day period of lowest 700-mb. index, January 7–11, 1956. Note complete reversal of normal westerly flow between 35° and 55° N. on the east coast of North America.

of the first center was associated with the migration and intensification of a strong daily anticyclone, whose track is reproduced in Chart IX. This High originated in the northeast tip of Siberia on January 3, moved southeastward across Alaska and central Canada, and then curved northeastward to reach Davis Strait on January 9. Here its central intensity of 1064 mb. exceeded by some 25 mb. the highest sea level pressure ever observed in this area [8]. During the next week both the daily anticyclone and the 5-day mean 700-mb. height anomaly weakened and moved southeastward. The daily High then dissipated, but the 5-day mean anomaly was reinforced by a new blocking surge as it moved northwestward during the remainder of the month.

2. MONTHLY MEAN CIRCULATION

When considered on a monthly mean basis, the zonal index was also at a record low level during January 1956, as indicated in table 1. The sea level index, computed for the Western Hemisphere alone, was the lowest for any month of record, while the 700-mb. index was farther below normal than in any previous month. In order to take advantage of sea level indices computed by Willett [10] for the entire Northern Hemisphere from 1899 to 1939, and recently brought up to date in the Extended Forecast Section, the zonal index for January 1956 was recomputed to include the entire hemisphere. The resulting index was 2.5 m. p. s. below the January normal,

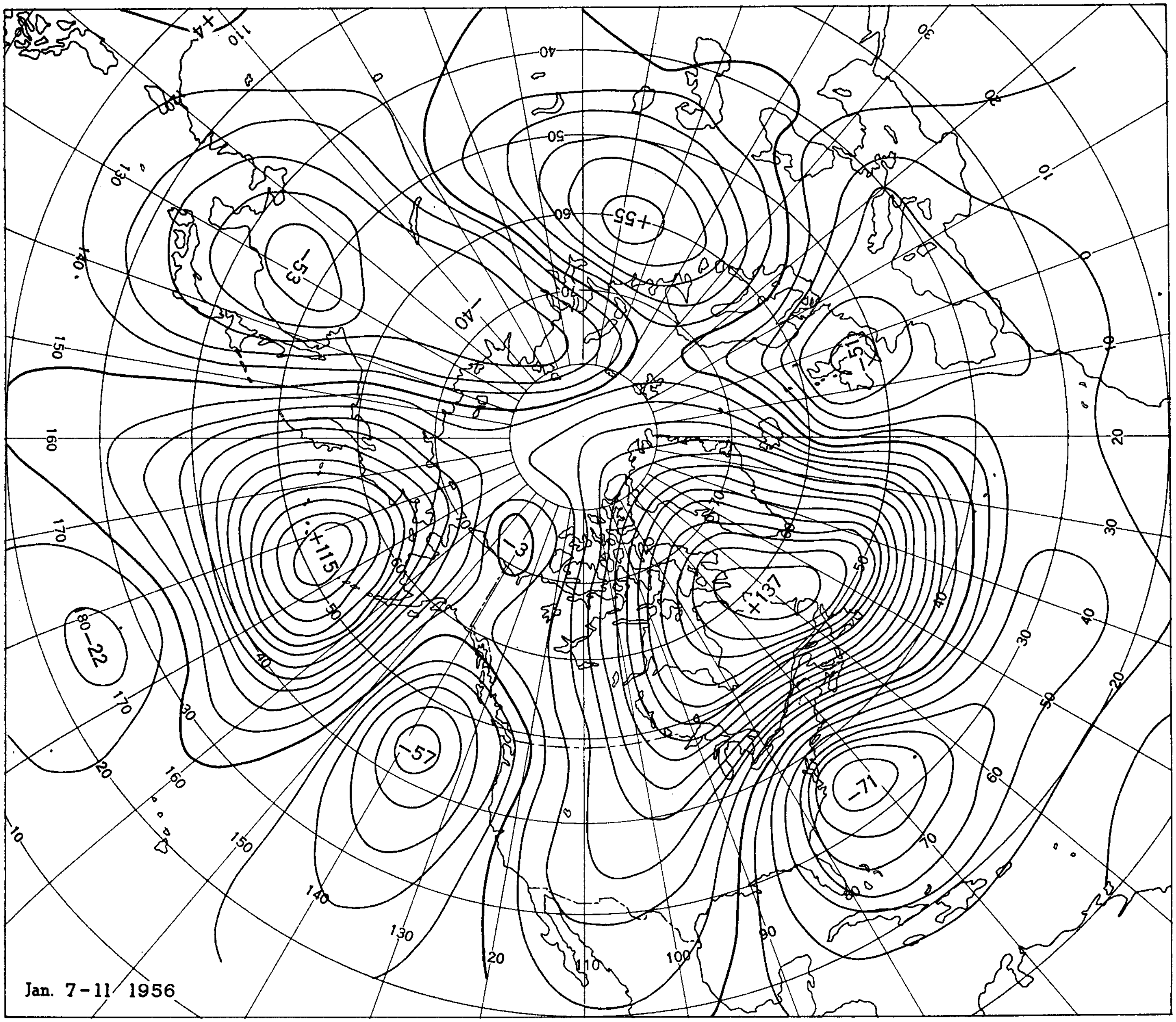

FIGURE 6.—Five-day mean 700-mb. height anomalies (in tens of feet) for the same period shown in figure 5. The anomaly pattern was actually simpler than the contour pattern since subtropical high cells over Mexico, Hawaii, and western Pacific in figure 5 lost their separate identity in this anomaly chart.

the greatest negative departure from normal for any month of a 47-year period of record.

The monthly mean profiles averaged over the Western Hemisphere are drawn as solid lines in figure 2, for sea level pressure, and in figure 4 for 700-mb. wind speed. Both lines fall about half way between the January normal profile (dashed) and the extreme 5-day mean values (dotted). Nevertheless low index characteristics were well-marked for the month as a whole. Pressures were above normal at all latitudes north of 45° N., but below normal to the south. Zonal wind speeds at 700-mb. were weaker than normal between 30° and 55° N., but stronger than normal elsewhere. The west wind maximum was displaced southward by about 10° of latitude and weakened by almost 5 m. p. s.

The mean 700-mb. chart with superimposed height departures from normal for January 1956 (fig. 8) contains most of the features already discussed in connection with the extreme 5-day mean map of January 7–11 (figs. 5 and 6). For example, the greatest departures from normal in figure 8 are the positive anomalies near Labrador and the Aleutians and the negative anomalies off the Carolina and Oregon coasts. These centers were remarkably persistent during the month, and each could be identified during every 5-day mean period, as indicated by figure 7. As on the 5-day mean map, the areas

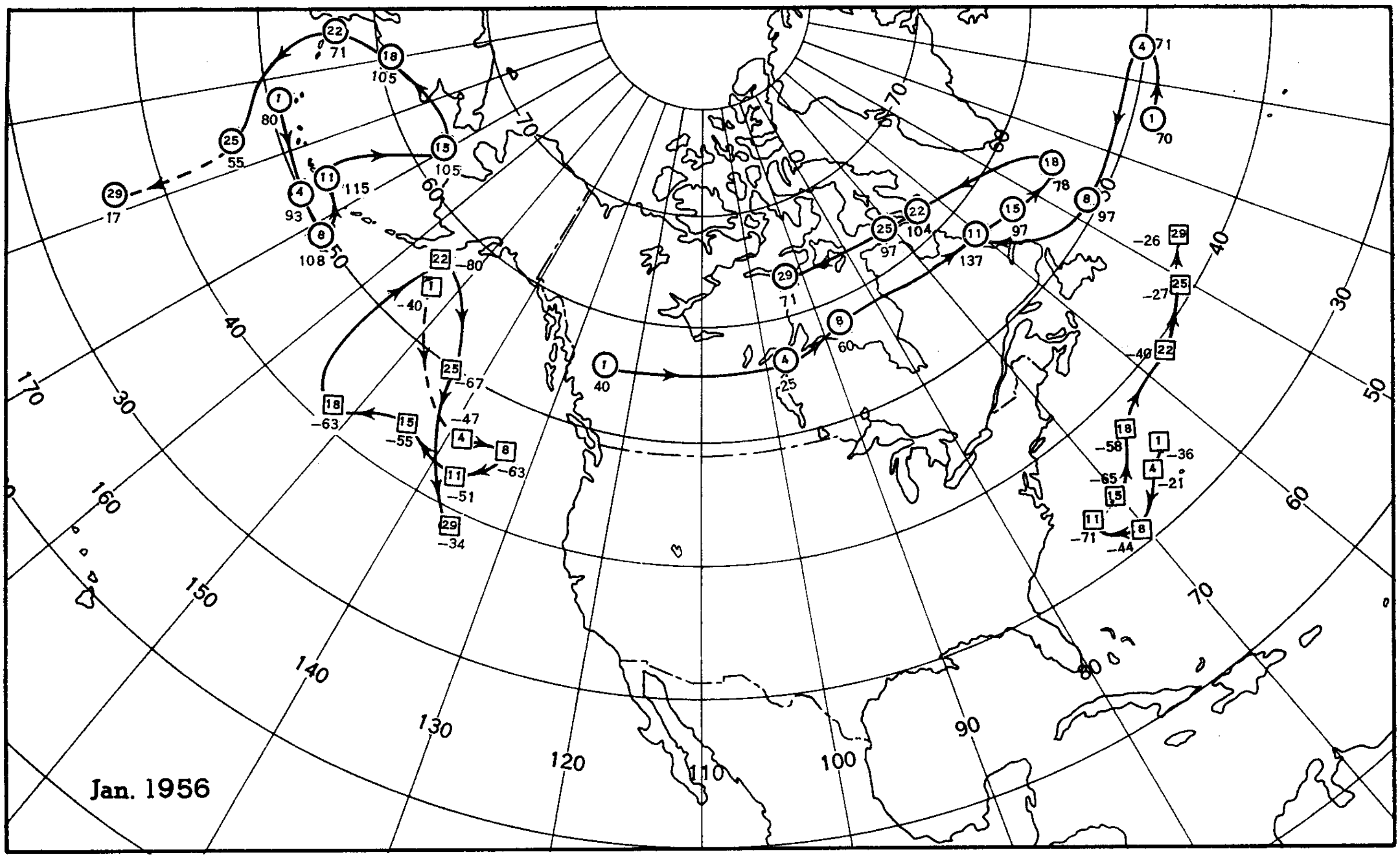

FIGURE 7.—Trajectories of four largest centers of 700-mb. height anomaly in figure 6 on all of 5-day mean charts during January 1956. The number inside each open square (for the two negative centers) and circle (for the positive anomalies) is the last day of the 5-day period, and the number alongside is the central intensity in tens of feet. Trajectories are dashed in regions of less certain continuity. The most intense anomaly of the month (+1,370 ft. in Labrador, Jan. 7–11) was an amalgamation of two separate centers, one moving eastward across Canada, and the other retrograding from mid-Atlantic.

of lowest index on the monthly mean were the central Pacific and the east coast of North America, while relatively fast westerlies prevailed in Europe, the eastern Pacific, and along the east coast of Asia. In fact, the January zonal index (35°–55° N.) was slightly above normal when computed for the Eastern Hemisphere alone.

This regional differentiation of wind speed is well illustrated by figure 9, which gives the geographical distribution of geostrophic wind speed computed from the monthly mean 700-mb. chart (fig. 8). Centers of slow wind speed in Maine and the central Pacific were close to the axis of maximum wind speed on the normal January map (dashed line in fig. 9A). As a result this month's wind speeds were as much as 16 m. p. s. below normal in these two areas (fig. 9B). On the other hand, wind speeds averaged above normal in Europe, the eastern Pacific, and the Asiatic coast. Perhaps the most noteworthy feature of figure 9A is the fact that the solid arrow delineating the principal axis of maximum wind speed was displaced south of its normal position in all parts of the hemisphere from Lake Baikal eastward to the mid-Atlantic. However, secondary axes of maximum wind speed were present at high latitudes, north of the positive anomalies in Labrador and the Aleutians (fig. 8). Thus, blocking existed in the sense prescribed by Berggren, Bolin, and Rossby [11]; i. e., a split jet stream with one branch passing north and the other south of the block.

3. TRANSITION DURING THE MONTH

Figure 10A presents the 15-day mean circulation pattern at 700 mb. over the Northern Hemisphere during the first half of January 1956. Both the contours (solid) and height departures from normal (dashed) closely resemble their 5-day mean counterparts of January 7–11 (figs. 5, 6). By the second half of the month, however, several interesting changes had occurred, as illustrated in figure 10B. In the Eastern Hemisphere an incipient blocking High developed just north of Novaya Zemlya. This was accompanied by marked deepening of a trough in eastern Europe. The resulting easterly anomalous flow in northern Europe was the prelude to the severe weather which overspread the entire continent during February.

In the Western Hemisphere the two strong positive anomaly centers between 50° and 60° N. weakened and

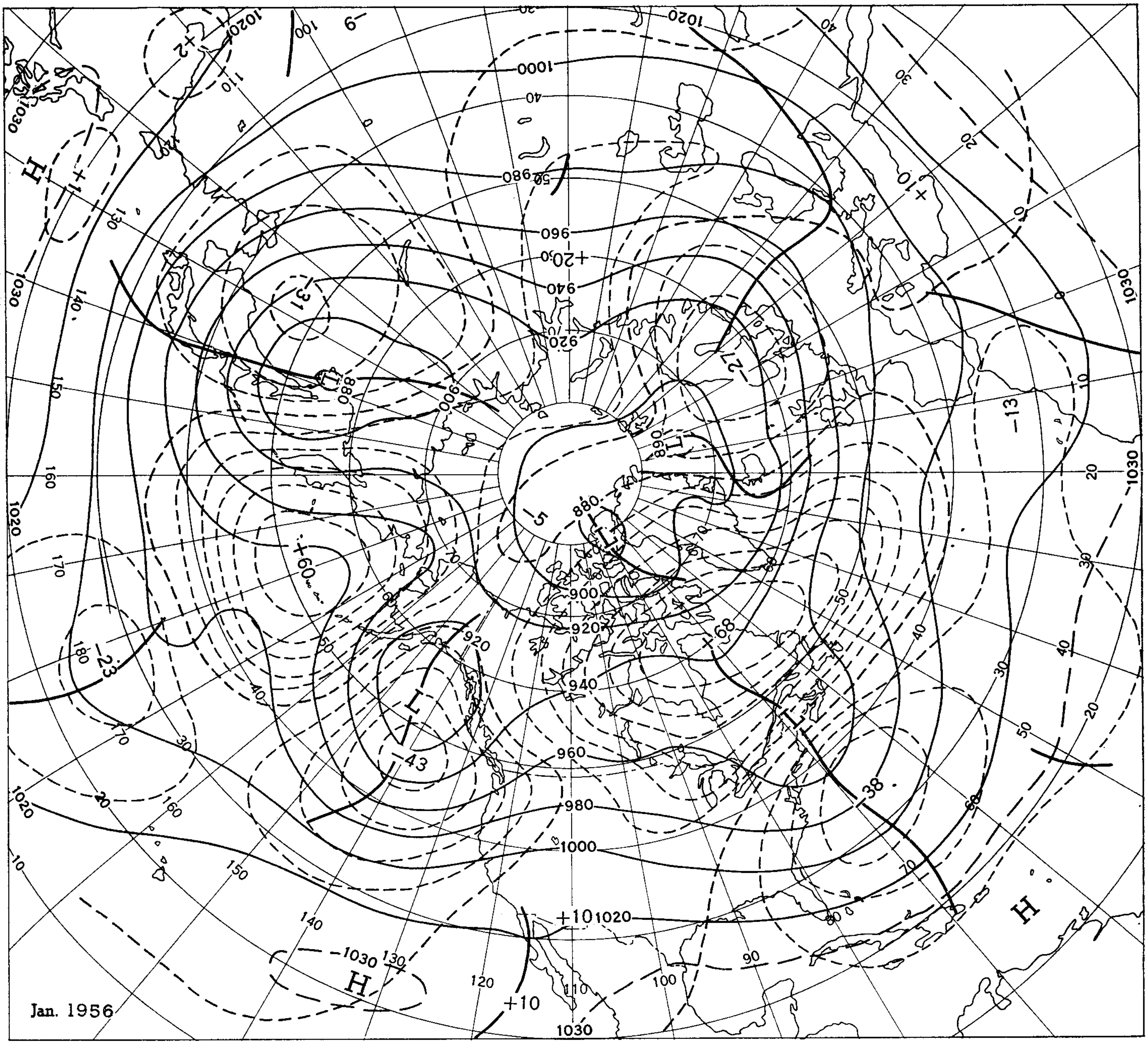

FIGURE 8.—Thirty-day mean 700-mb. height contours and departures from normal (both in tens of feet) for January 1956. Outstanding features were large centers of positive anomaly in eastern Canada and Aleutians, surrounded almost completely by negative anomalies.

retrograded from the first to the second half of January. The trough in the eastern Pacific also retrograded; but the trough off the east coast moved eastward as the flow pattern in the Atlantic flattened, so that the trough was no longer blocked by a strong ridge in mid-ocean. At the same time that the wavelength across the United States thus increased, the speed of the westerlies in North America diminished as retrogression of the Atlantic block produced a closed High over Hudson Bay. The result was formation of a new mean trough in the familiar manner [12]. The new trough was located in the central United States, where above normal heights during the first half of the month were replaced by below normal heights in the second half.

The effect of these circulation changes upon the temperature regime in the United States was marked. Following generally warm conditions during the first week of January, progressive, westward cooling occurred, with coldest weather during the second week of the month in the Southeast, the third week in the Great Plains, and the fourth week in the Northwest. The changes in precipitation were even more dramatic. In the first half of the month little or no precipitation fell in most southern and central portions of the Nation. This dry spell, which had begun in early December, was broken in most areas during the week ending January 22. Precipitation intensified the next week, when over 4 inches fell in parts of Arkansas and Tennessee.[2]

4. MONTHLY MEAN WEATHER IN THE UNITED STATES

Mean surface temperatures in the United States during January 1956 averaged above normal from the eastern slopes of the Rockies westward to the Pacific Coast (Chart I-B). Greatest departures from normal (up to 10° F. for the month) were observed in Utah and surrounding States. This was the warmest January ever recorded at Tucson, Ariz., and Grand Junction, Colo. Warmth in the West was associated with a mean ridge, above normal heights, and faster than normal southwesterly flow at 700 mb. (fig. 8). Domination by mild maritime air is well indicated by the axis of the mean 700-mb. jet stream, which extended from the Hawaiian Islands into Idaho (fig. 9A), and by the center of greater than normal wind speeds (as much as 10 m. p. s.) off the coast of California (fig. 9B).

The Pacific air masses which invaded the West at frequent intervals during the month were not only extremely warm but also extremely moist. When this moisture-laden air was forced to ascend the western mountains by strong southwest winds at both sea level (Chart XI) and 700 mb. (fig. 8), copious amounts of rain and snow were released. Not all the precipitation was orographically produced however. A good deal was cyclonic and frontal in nature, as evidenced by Chart X and by the fact that sea level pressure averaged well below normal throughout the West (Chart XI inset).

Chart III shows that precipitation totals were more than twice the normal amount in all the west coast States and greater than normal nearly everywhere west of the Continental Divide. This was the wettest January on record at Burns, Oreg., and Los Angeles, Calif. In the latter city 7.18 inches of rain fell on the 25th and 26th, including a new record for 24-hour amount. At Sacramento, Calif., total precipitation of 19.78 inches during December and January was the greatest consecutive 2-month total since 1862. In addition, January 1956 was the cloudiest month on record at Burbank, Calif. and Yuma, Ariz. (Chart VI). Although floods were widespread during the month, they were not as disastrous as those of December [3].

Like the west coast, the North Atlantic States were under the influence of extremely moist and mild air masses from the adjacent ocean during most of the month. In this case, strong anomalous flow components from the east at both sea level (Chart XI inset) and 700 mb. (fig. 8) carried air masses with a long trajectory over the Atlantic Ocean into this region. The result was above normal values of both temperature (Chart I-B) and precipitation (Chart III). This was the warmest January on record at Caribou, Maine, and the wettest at Blue Hill, Mass. Onshore cyclonic flow was most extreme from January 7 to 17. (See sec. 1 and figs. 3, 5, 6.) During this period Boston, Mass. recorded 5.70 inches of precipitation and 10 consecutive days without sunshine.

Easterly anomalous flow was also responsible for bringing some mild Atlantic air and above normal temperatures to the western Great Lakes region and upper Mississippi Valley. In this area the Lakes themselves probably acted as a local heat source. This is indicated by the fact that the greatest departures from normal occurred on the western shores of the Lakes (+6° F. in Duluth, Minn., +4° F. in Milwaukee, Wis.), while temperatures

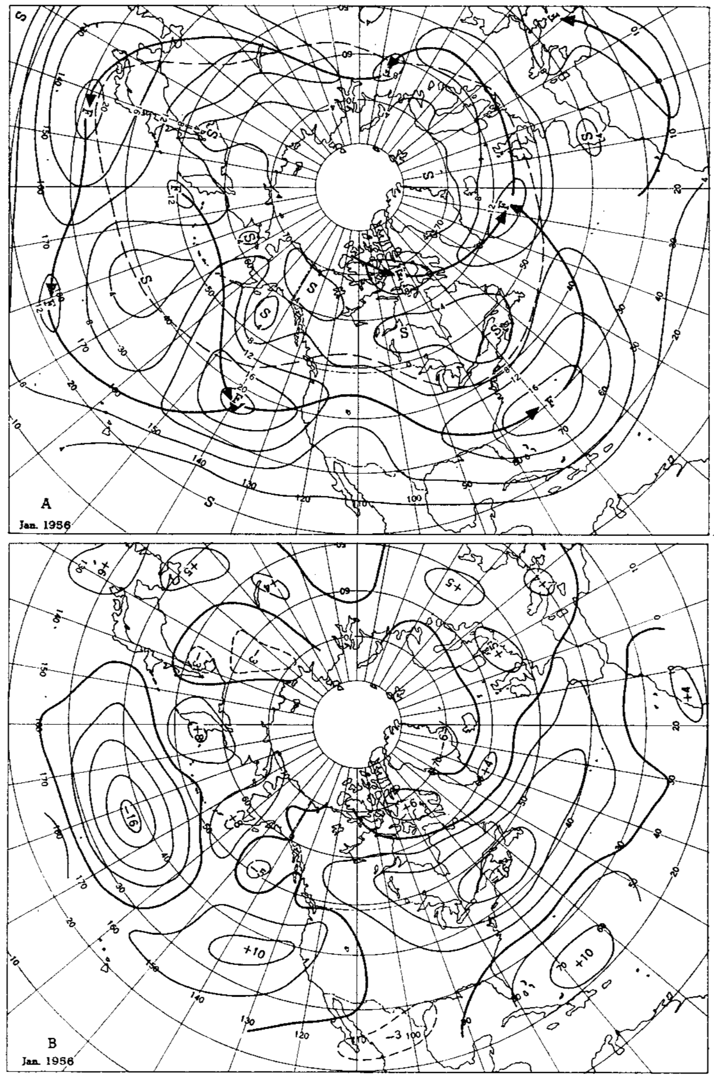

FIGURE 9.—(A) Mean 700-mb. isotachs and (B) departure from normal wind speed (both in meters per second) for January 1956. Solid arrows in (A) are drawn through axes of the mean jet stream at the 700-mb. level. Dashed line gives the position of this jet on the normal map for January. Centers of fast and slow wind speed are denoted by F and S. Note widespread southward displacement of primary jet axis, especially in the western Atlantic and mid-Pacific, where the jet was even south of its extreme position of December 1955 [3].

[2] Charts showing the weekly patterns of temperature and precipitation are given in the *Weekly Weather and Crop Bulletin, National Summary*, vol. XLIII, Nos. 2-5, January, 1956.

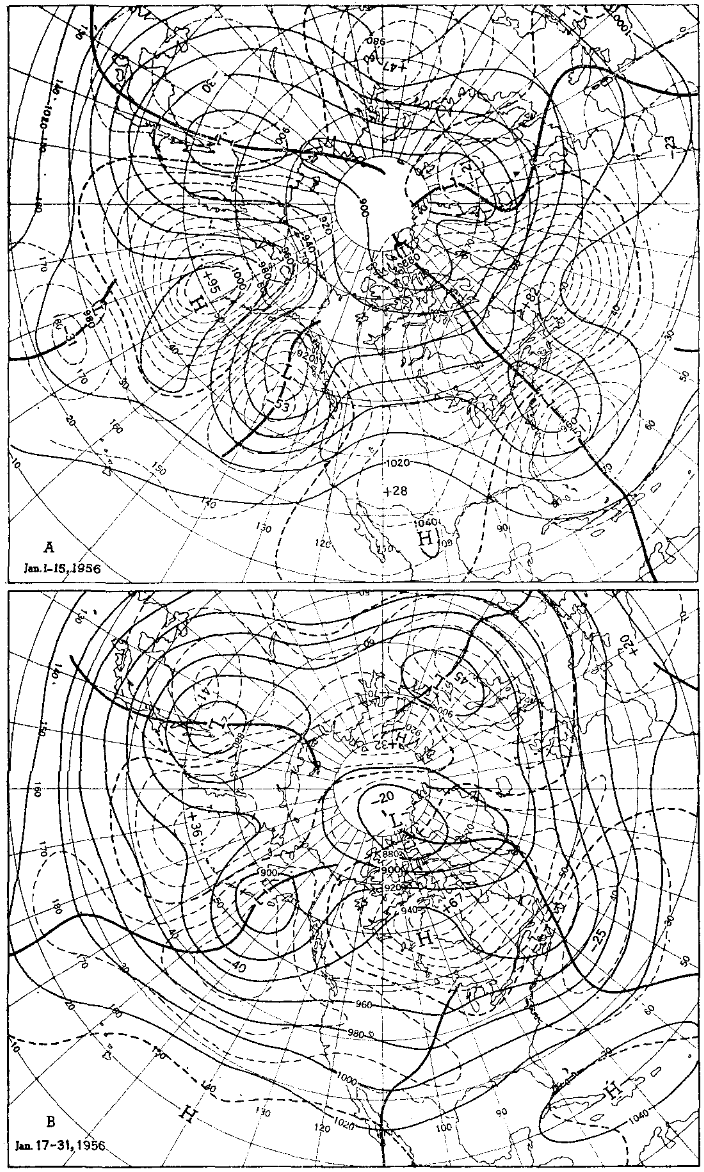

FIGURE 10.—Fifteen-day mean 700-mb. height contours and departures from normal (both in tens of feet) for periods (A) January 1–15, 1956 and (B) January 17–31, 1956. Note formation of new trough east of Continental Divide during second half of month as wave length increased between progressive trough in western Atlantic and retrogressive trough in eastern Pacific, while the westerlies in North America were weakened and displaced southward by development of blocking High over Hudson Bay.

were slightly below normal over the easternmost Lake (Lake Ontario). Precipitation in the Great Lakes region was generally subnormal. Chicago, Ill., reported its second driest January in 86 years of record, while Sault Ste. Marie, Mich. enjoyed its sunniest January in history (Chart VII). This fair weather was a consequence of a stronger than normal mean ridge through the western parts of Hudson Bay and the Great Lakes at both sea level and 700 mb. The large number of daily anticyclone tracks north and west of the Great Lakes should also be noted (Chart IX).

Although easterly anomalous flow brought mild weather to New England and the western Lakes, it was accompanied by below normal temperatures in the northern Plains. Air reaching this area was cooled by passage over snow-covered land (Charts IV and V) and by ascent up the eastern slopes of the Rockies. Foehn warming was minimized by the prevailing easterlies as many daily anticyclones passed north of the area (Chart IX) and many daily cyclones were centered to the south (Chart X). More than twice the normal amount of precipitation, nearly all in the form of snow (Chart V-A), fell in North Dakota, where a minor trough was present at 700 mb. and the mean flow at sea level was cyclonically curved.

In the remainder of the United States, everywhere south of about 40° N. and east of about 95° W. both temperature and precipitation were generally below seasonal normals. The greatest temperature departures occurred in the South Atlantic States. This was the coldest January on record at Orlando, Fla., and the second coldest at Miami. New daily minimum temperature extremes were established during the month at the latter city and also at Savannah, Ga., and West Palm Beach, Fla. The deficiency of precipitation was even more marked. It was the driest January ever observed at Lynchburg, Va., Greensboro, N. C., and Burlington, Iowa. St. Louis, Mo., reported 46 consecutive days without measurable precipitation from December 2, 1955 to January 17, 1956, by far the longest such period of record. Cold dry weather in the southeastern quarter of the Nation was the result of northwesterly flow at 700 mb. between a ridge over the Rockies and a trough off the east coast, the ideal conditions for light precipitation in the Tennessee Valley [13]. The presence of a strong mean ridge at sea level and northerly anomalous flow components at both sea level and 700 mb. were additional contributing factors.

5. PERSISTENCE FROM DECEMBER

The large-scale features of the January 1956 circulation pattern (fig. 8) were extremely persistent from those of the preceding December [3], except over Eurasia. Both months were characterized by deeper than normal troughs off the east coast of the United States, in the eastern Pacific, and near Midway, and by stronger than normal ridges in the Bering Sea, Hudson Bay, and Greenland. A numerical measure of this persistence is given in the first line of table 2, which expresses the correlation coefficient between December and January anomalies of monthly mean 700-mb. height at standard intersections from 30° to 50° N. and 70° to 130 ° W. This year's persistence correlation was considerably higher than expected from random data and slightly higher than given by Namias [14] for the years 1942–50. It is interesting to note that Namias obtained a higher correlation coefficient between December and January than between any other pair of months.

TABLE 2.—*Persistence of monthly mean anomalies in the United States from December to January*

	1955–56	Normal (1942–50)	Random
700-mb. height (correlation)	0.42	0.39	0
Temperature (0 or 1 class change, %)	82	69	59
Precipitation (0 class change, %)	48	37	33

Persistence of the weather elements in the United States from December 1955 to January 1956 was even more striking, as shown by the last two lines of table 2. Of 100 stations evenly distributed over the country, there were 82 in which the temperature anomaly did not change by more than one class (out of five) and 48 in which the precipitation remained in the same class (out of three). This represents considerably greater persistence than expected either by chance or from past years [14]. Furthermore, extreme changes from this December to January were experienced by only 3 stations in temperature (3 or 4 class change) and 9 stations in precipitation (2 class change). It is possible that this year's unusual persistence was related to the prolonged period of low zonal index since Namias [14] has suggested that persistence is greater at times of low index.

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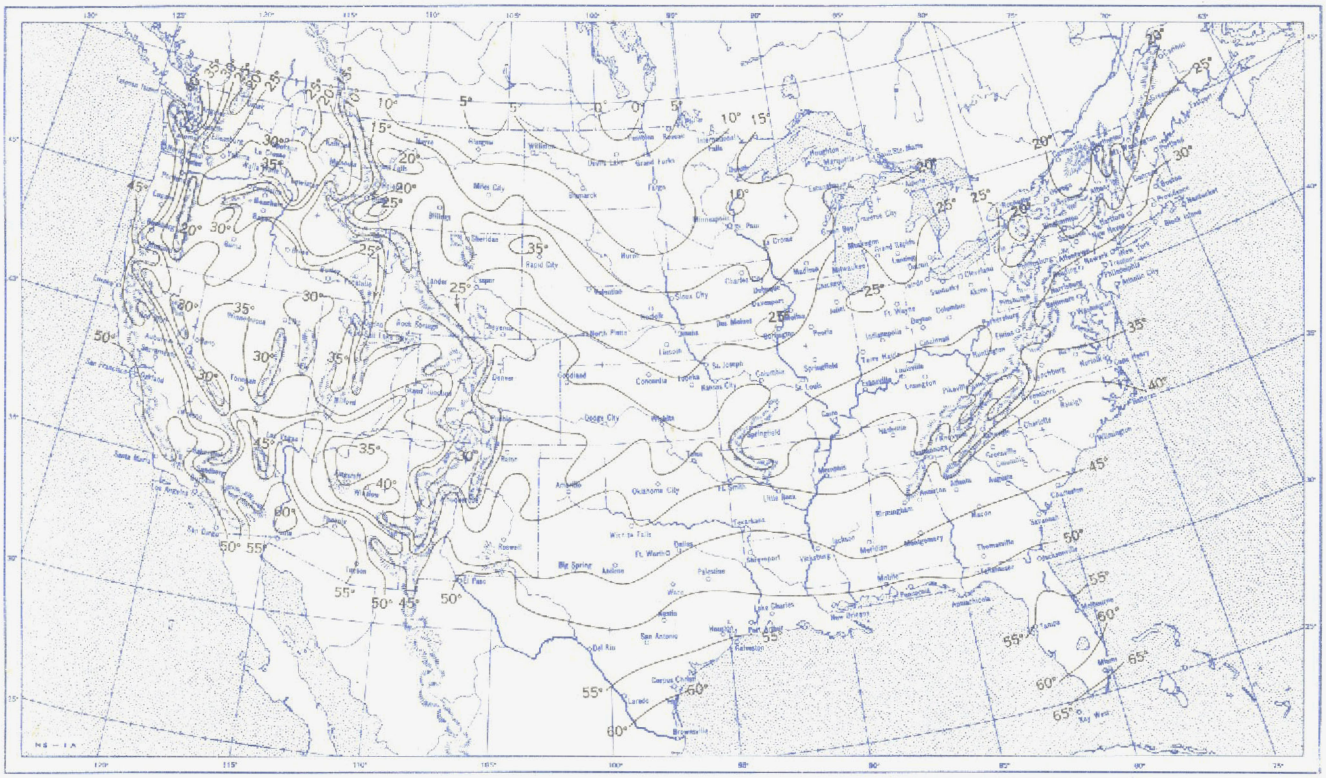
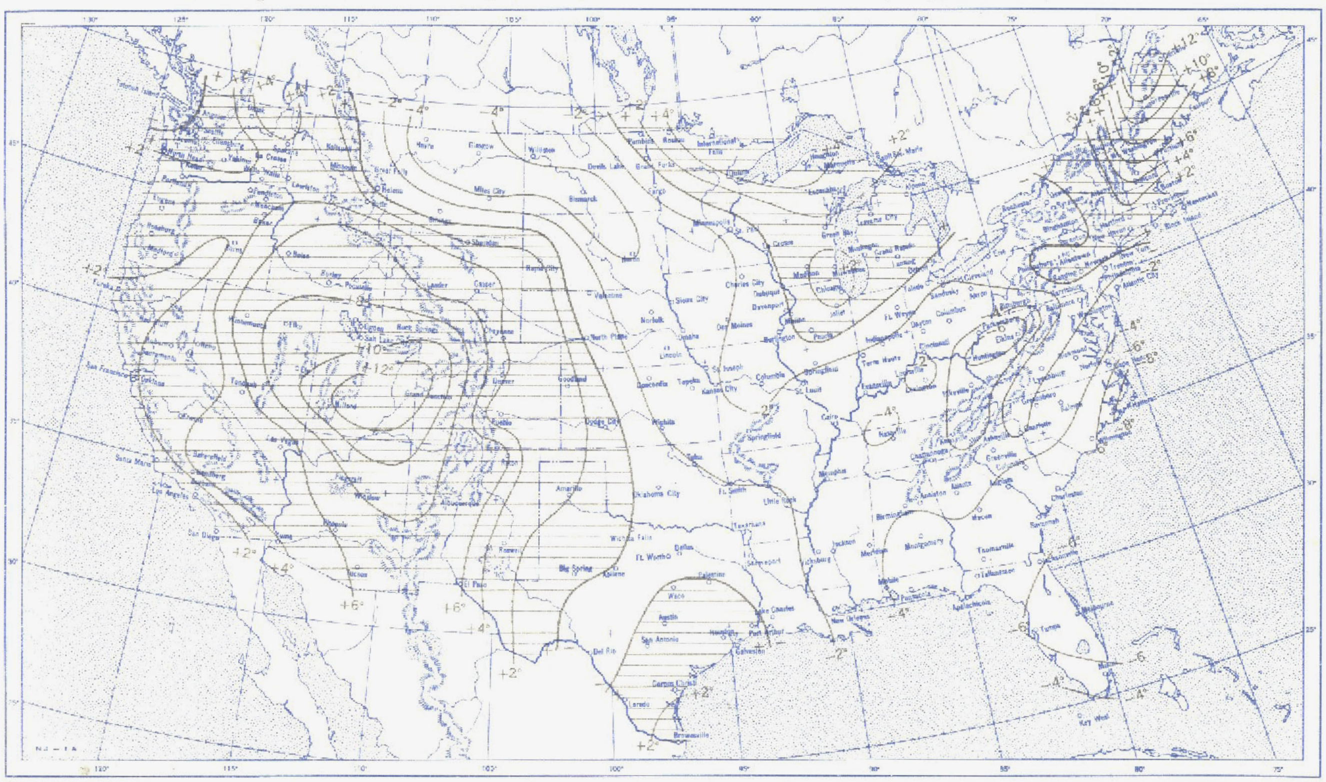
Chart I. A. Average Temperature (°F.) at Surface, January 1956.

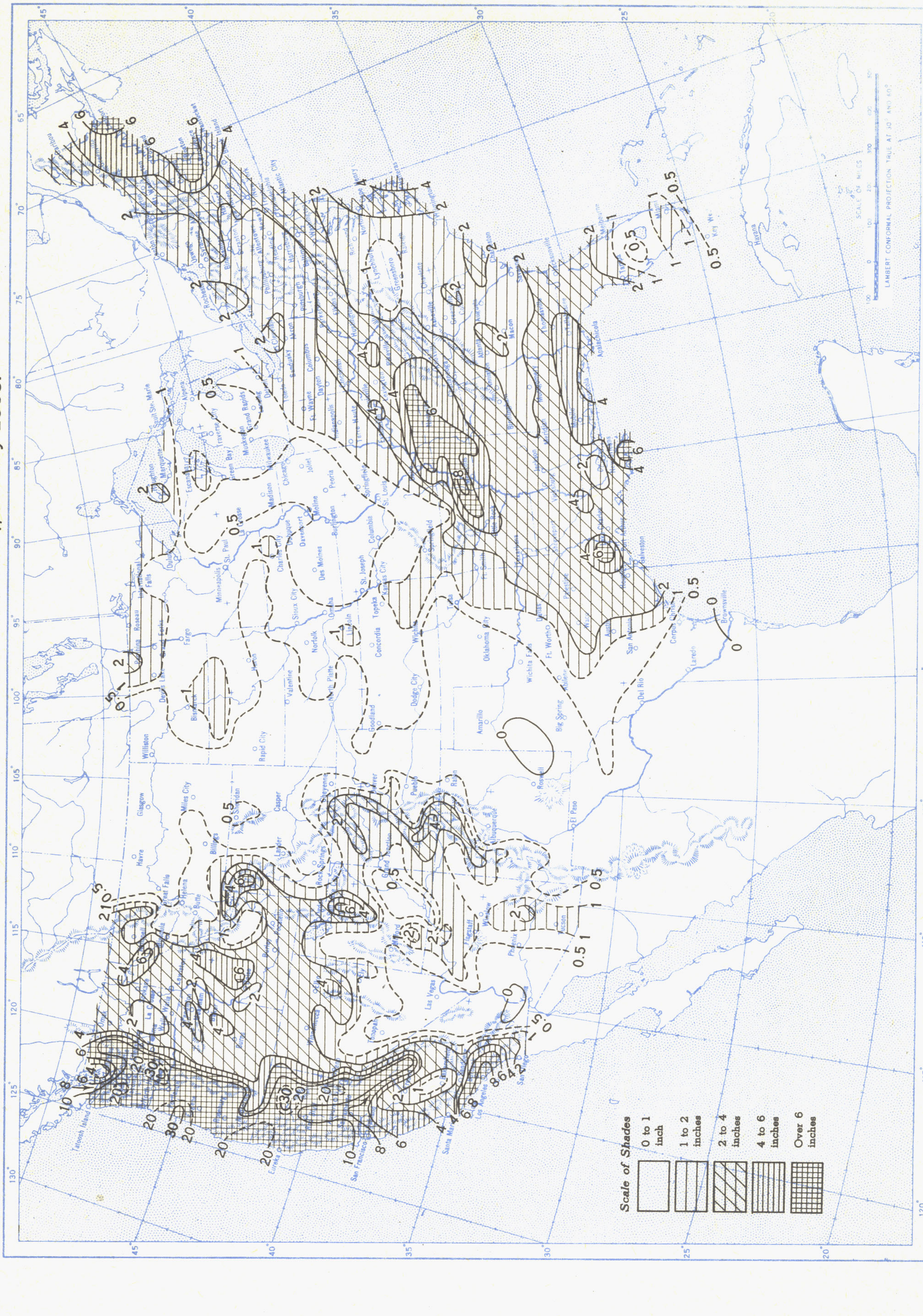


B. Departure of Average Temperature from Normal (°F.), January 1956.



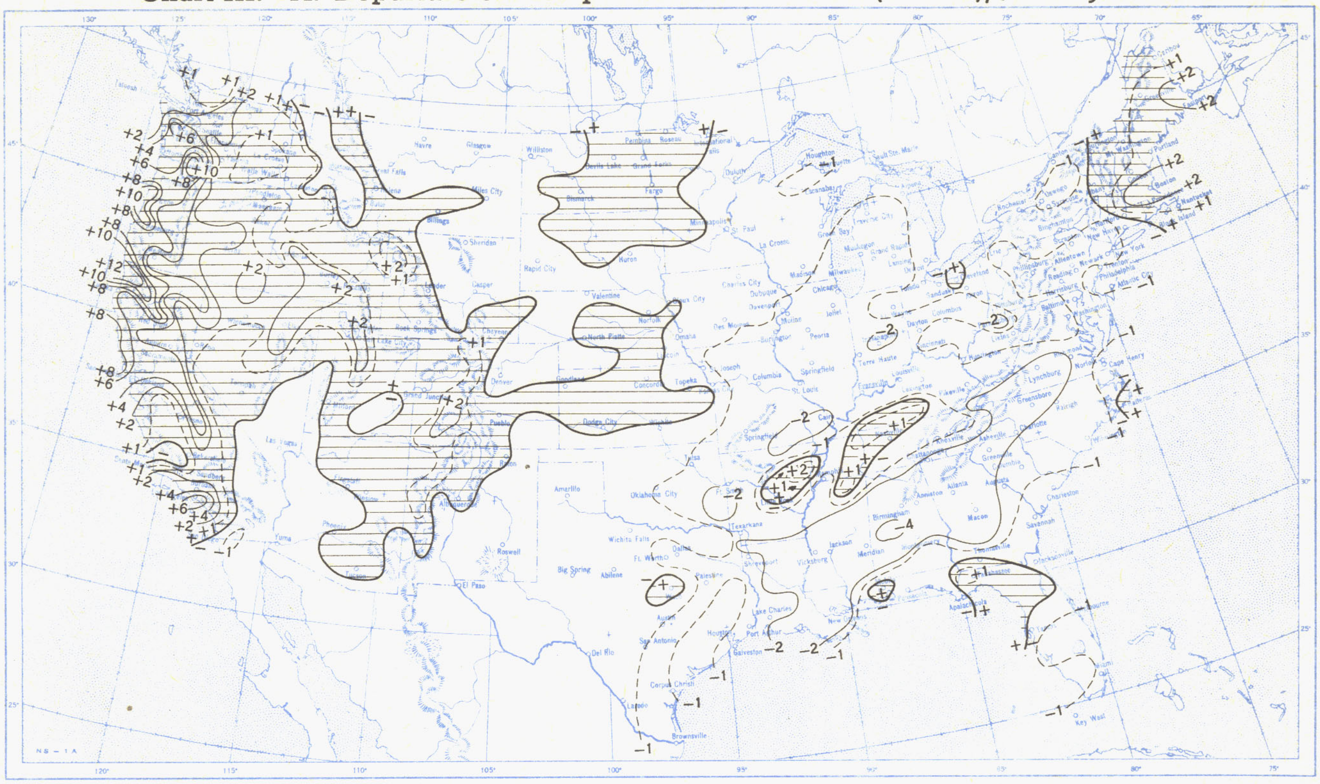
A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather Bureau stations having at least 10 years of record.

Chart II. Total Precipitation (Inches), January 1956.

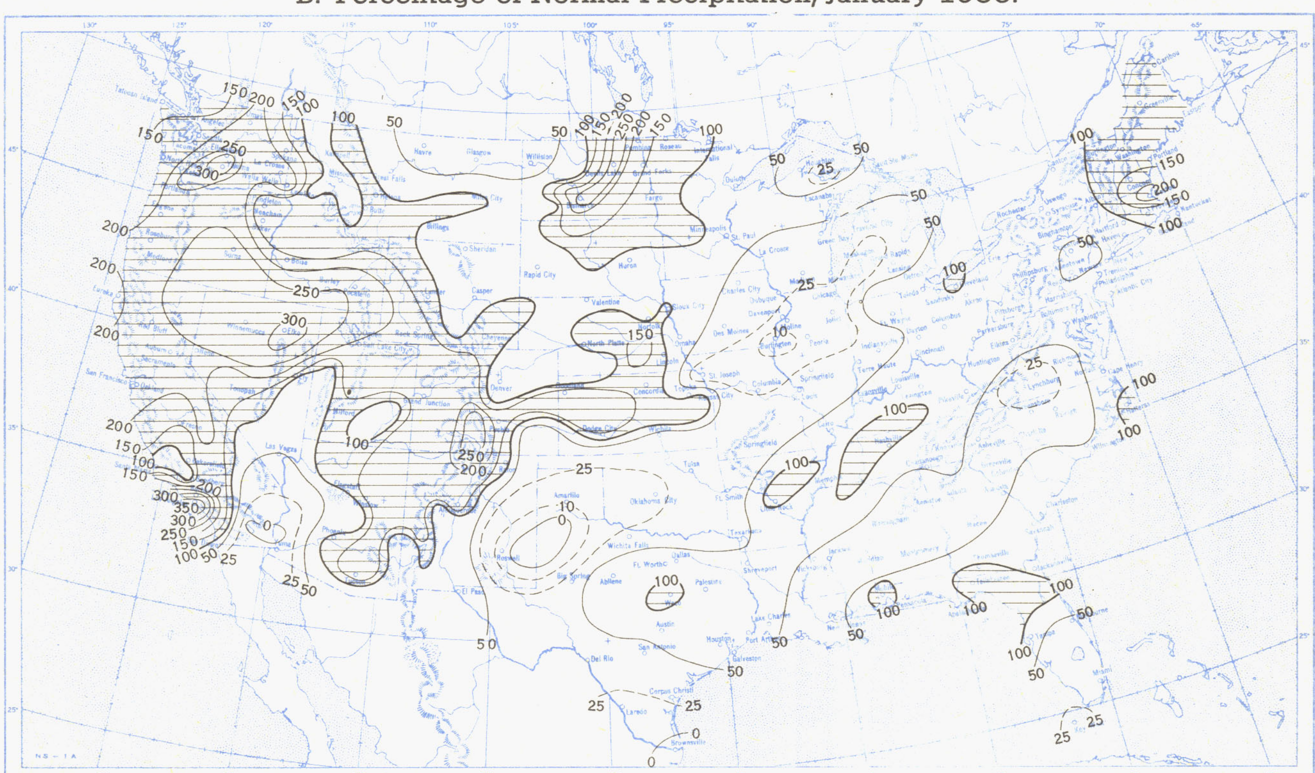


Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), January 1956.



B. Percentage of Normal Precipitation, January 1956.

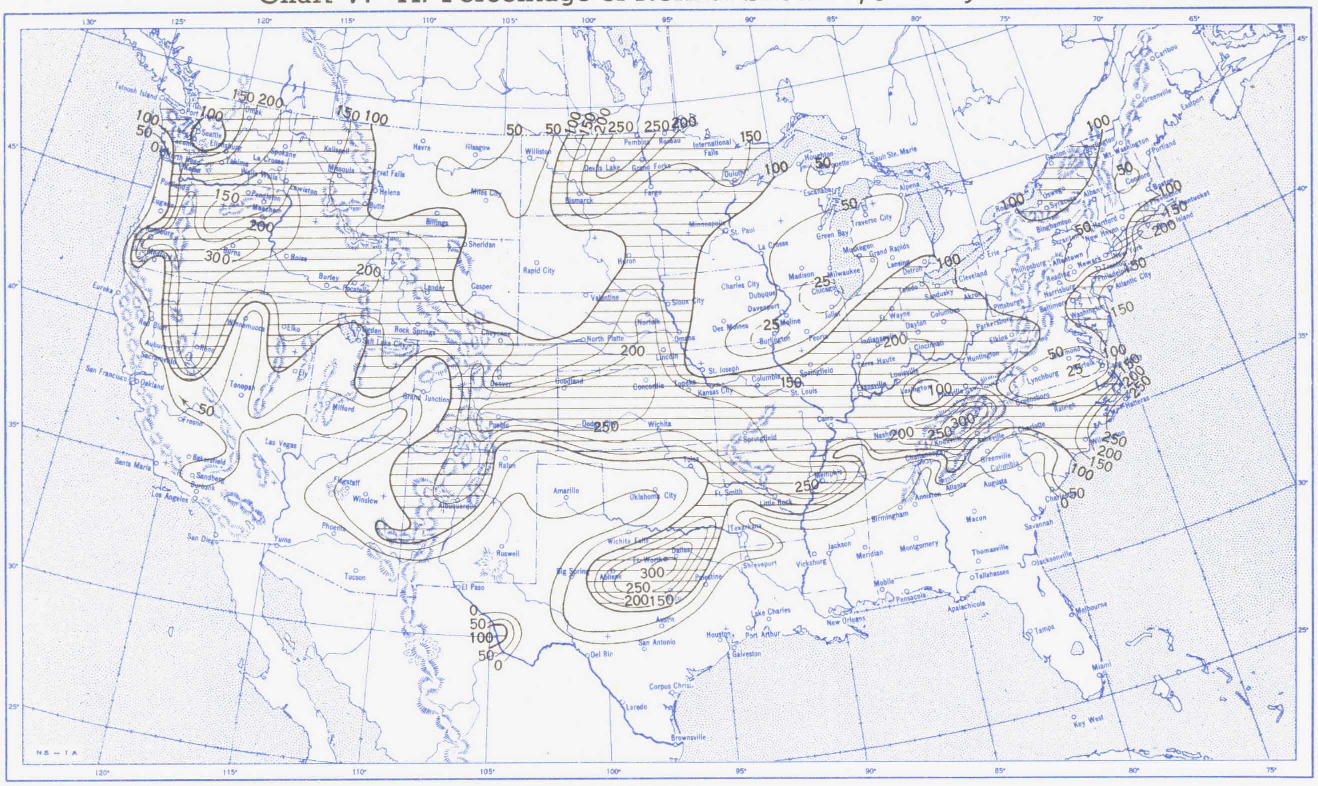


Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

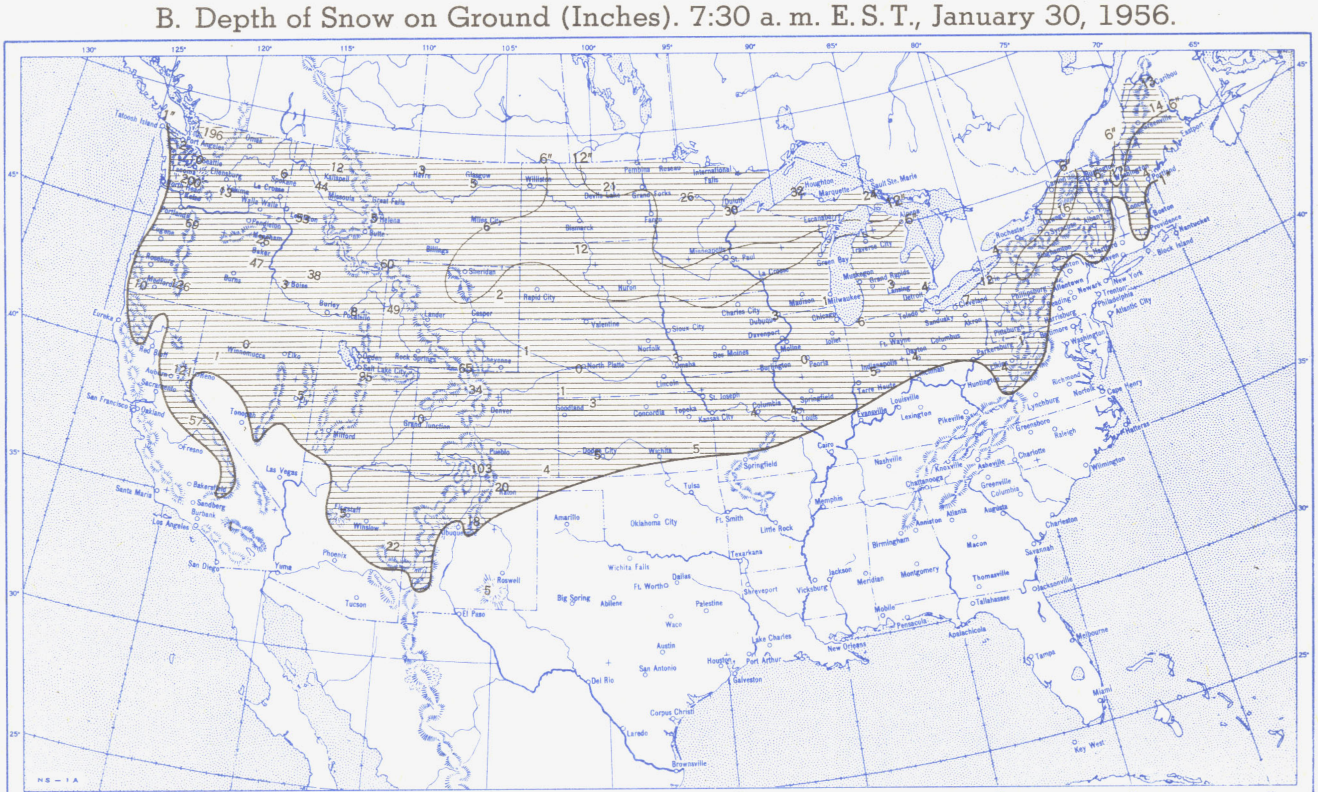
Chart IV. Total Snowfall (Inches), January 1956.

This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

Chart V. A. Percentage of Normal Snowfall, January 1956.

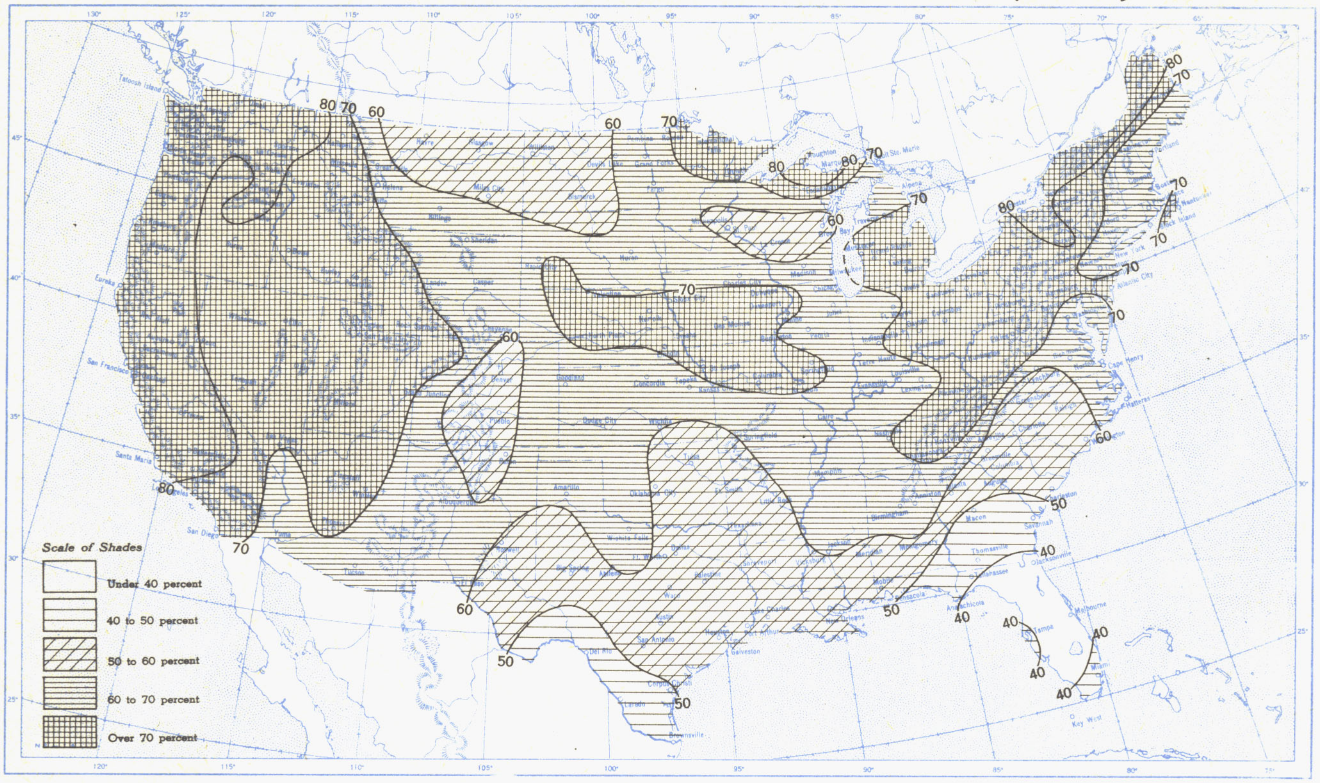


B. Depth of Snow on Ground (Inches). 7:30 a. m. E. S. T., January 30, 1956.

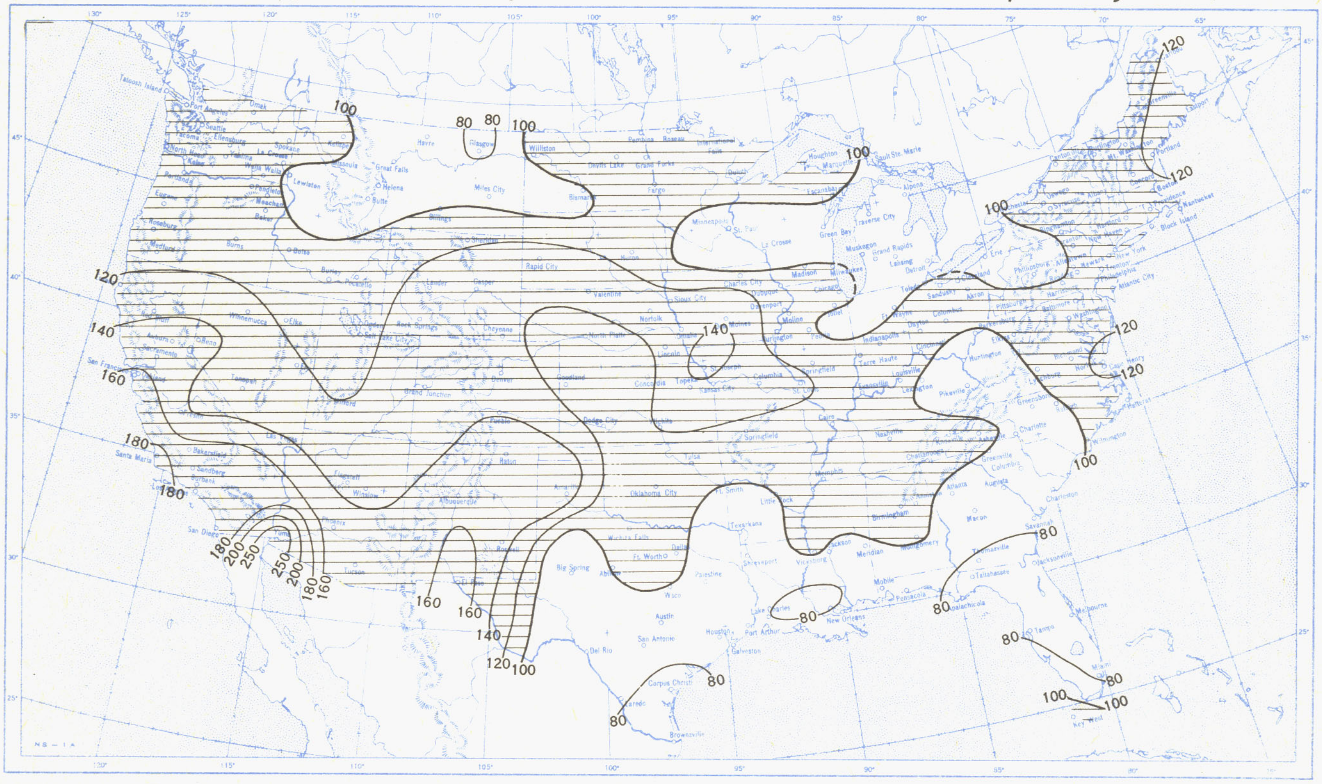


A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record.
B. Shows depth currently on ground at 7:30 a. m. E. S. T., of the Tuesday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, January 1956.

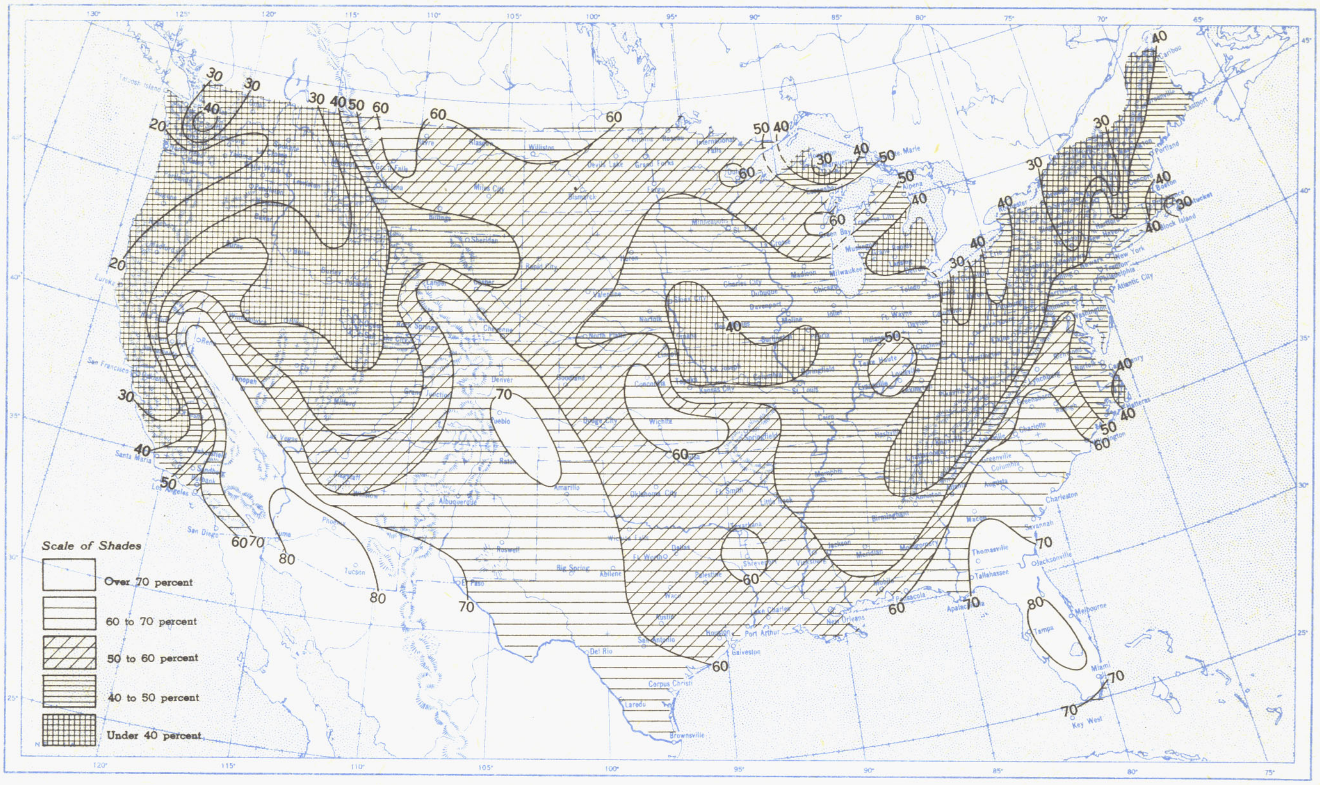


B. Percentage of Normal Sky Cover Between Sunrise and Sunset, January 1956.

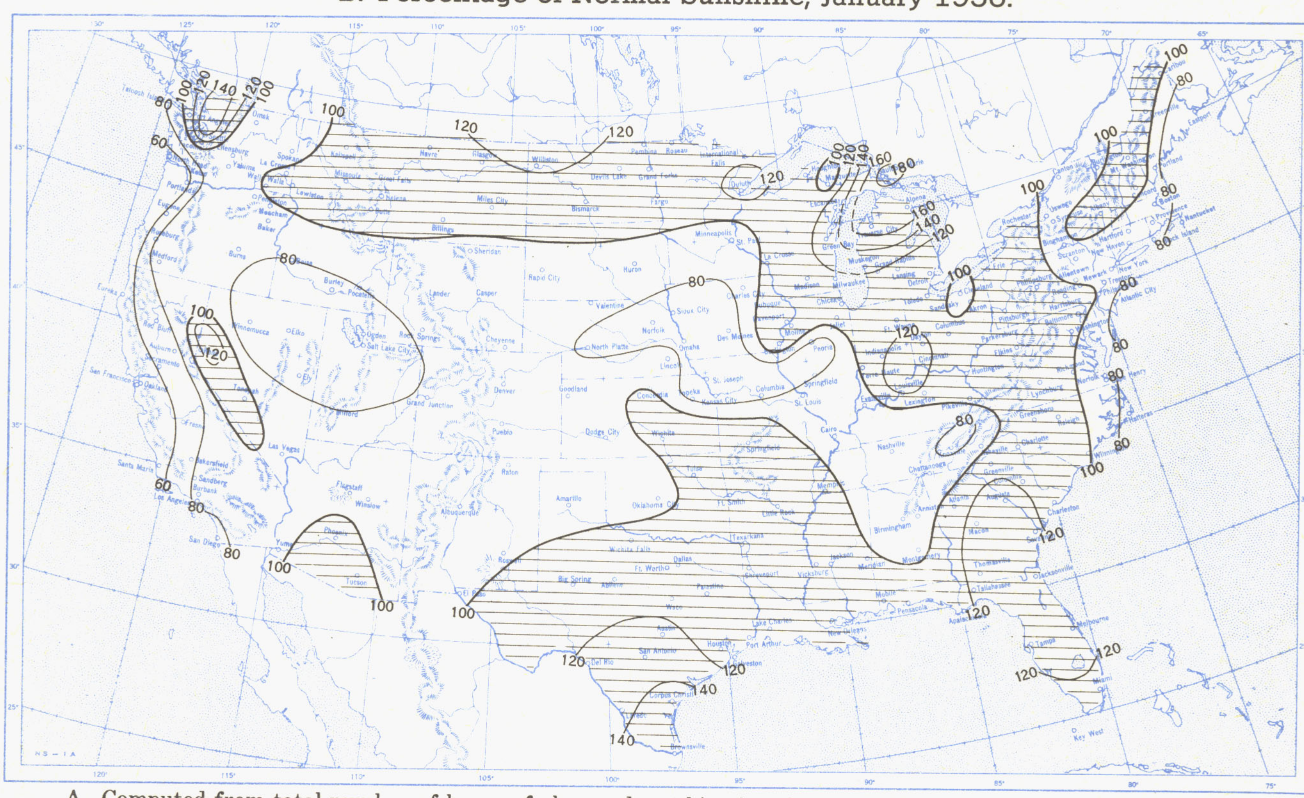


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, January 1956.



B. Percentage of Normal Sunshine, January 1956.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, January 1956. Inset: Percentage of Mean Daily Solar Radiation, January 1956. (Mean based on period 1951-55.)

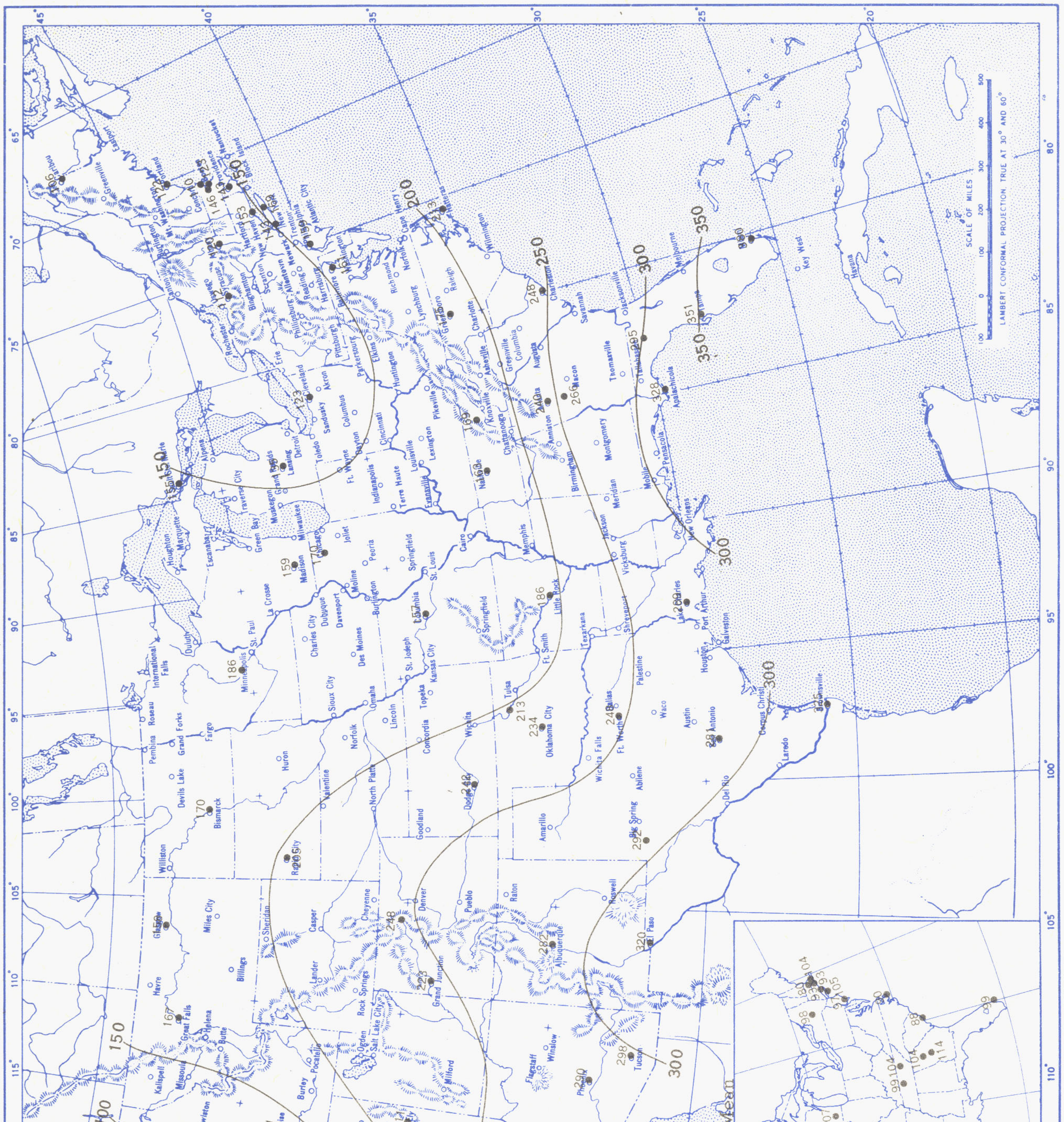
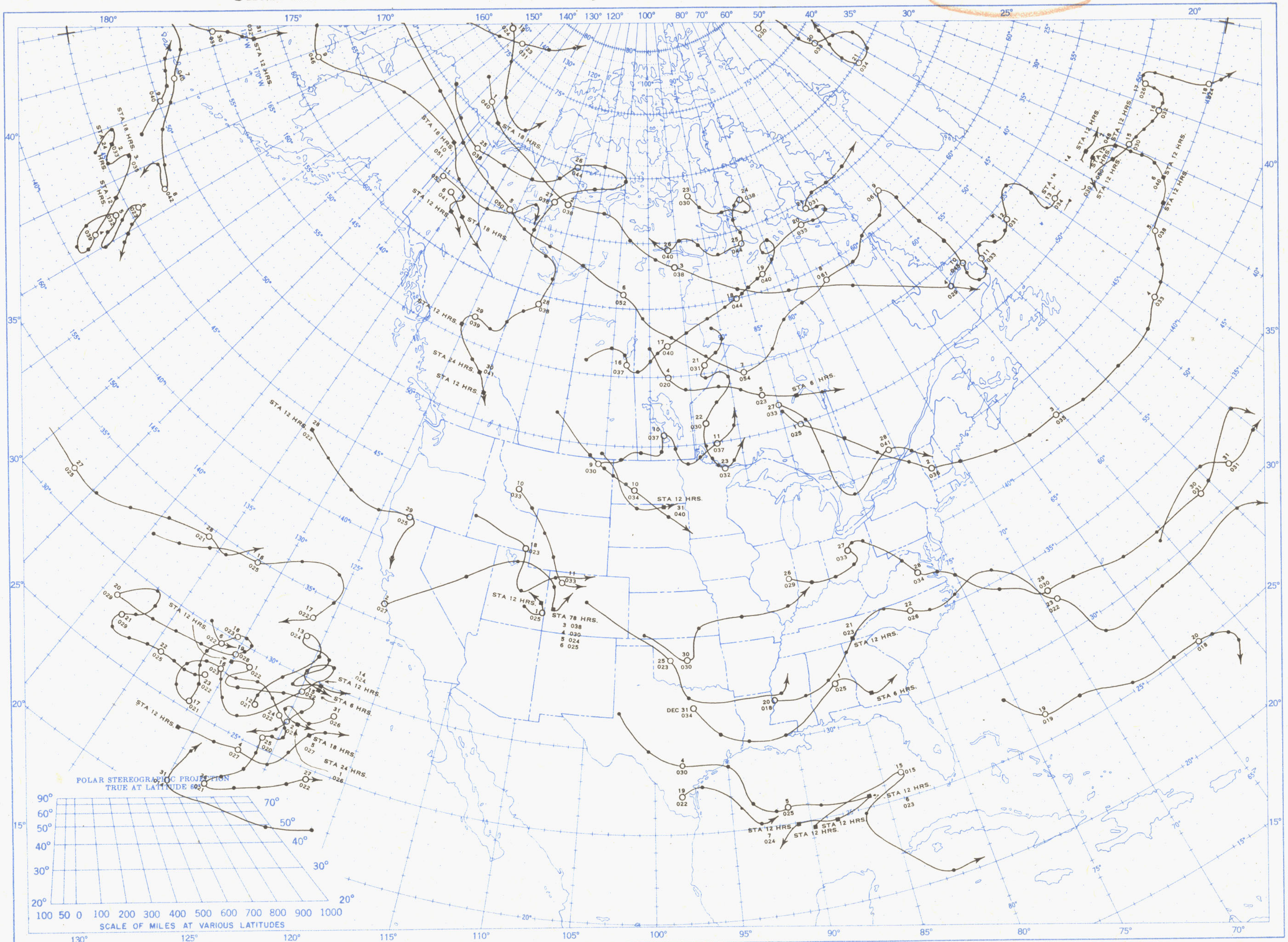


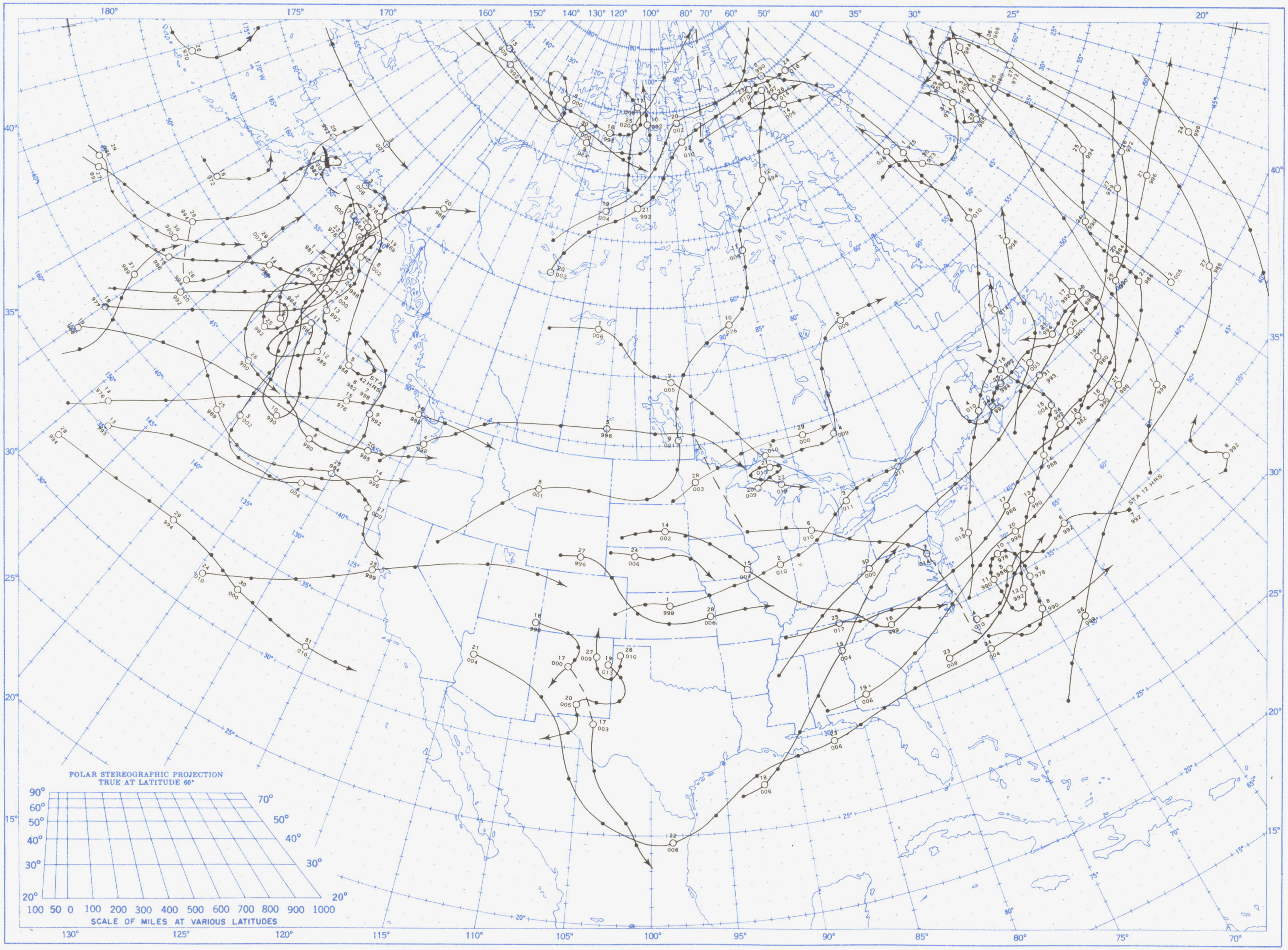
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm. $^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, January 1956. (Corrected)



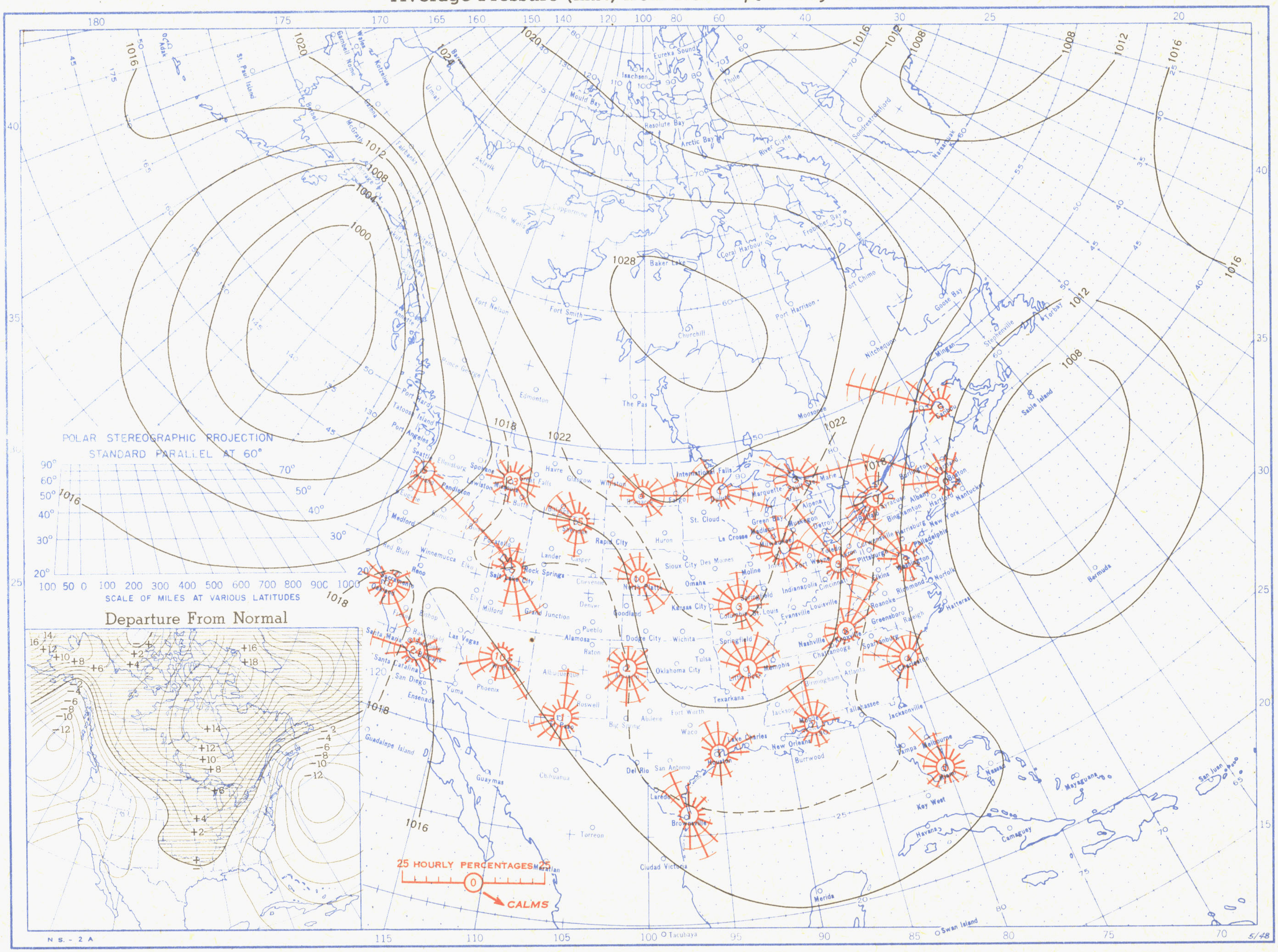
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

Chart X. Tracks of Centers of Cyclones at Sea Level, January 1956. (Corrected)



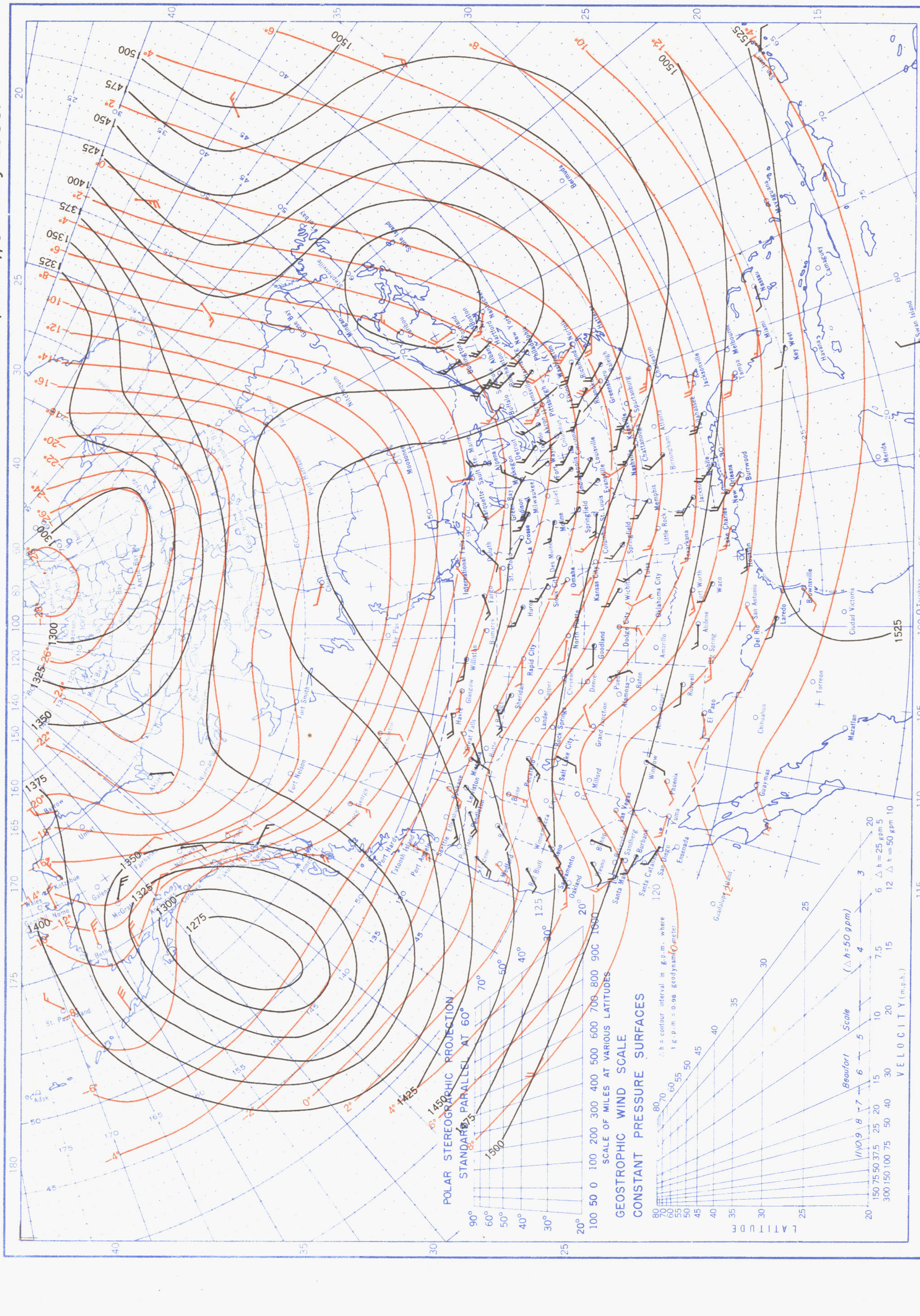
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, January 1956. Inset: Departure of Average Pressure (mb.) from Normal, January 1956.



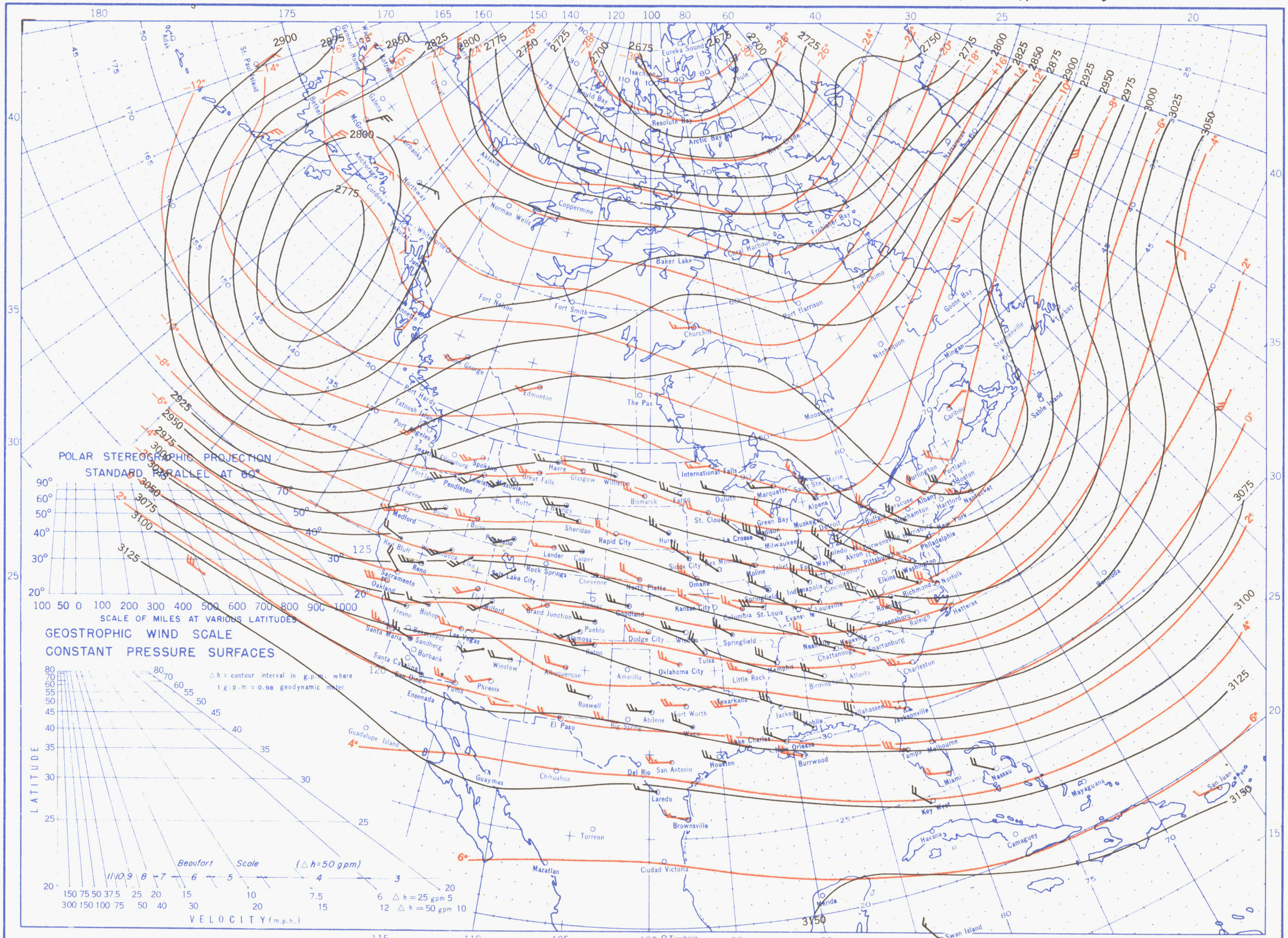
Average sea level pressures are obtained from the averages of the 7:30 a.m. and 7:30 p.m. E.S.T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 850-mb. Pressure Surface, Average Temperature in °C. at 850 mb., and Resultant Winds at 1500 Meters (m.s.l.), January 1956.



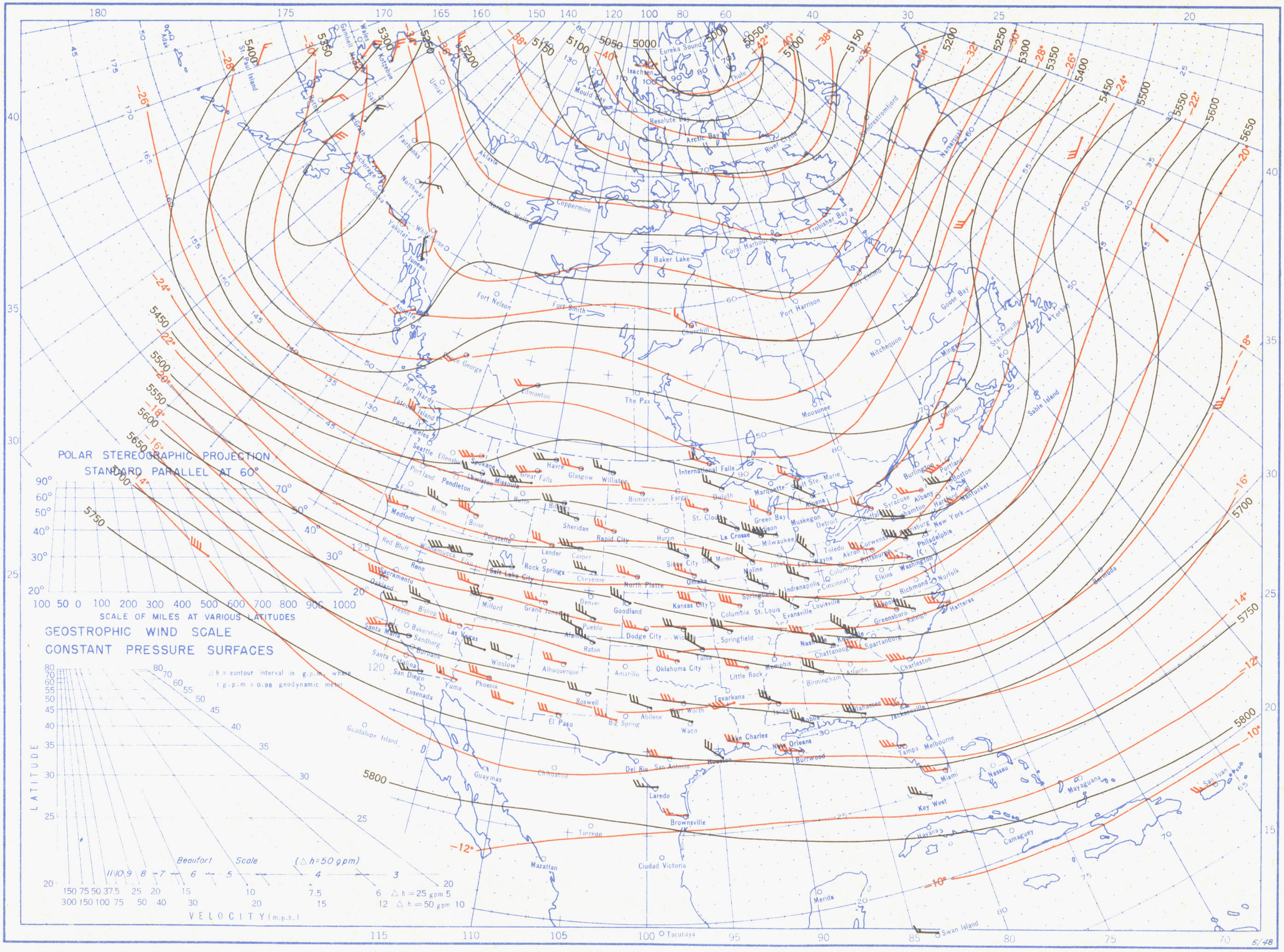
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XIII. Average Dynamic Height in Geopotential Meters (1 g.p.m.. = 0.98 dynamic meters) of the 700-mb. Pressure Surface, Average Temperature in °C. at 700 mb., and Resultant Winds at 3000 Meters (m.s.l.), January 1956.



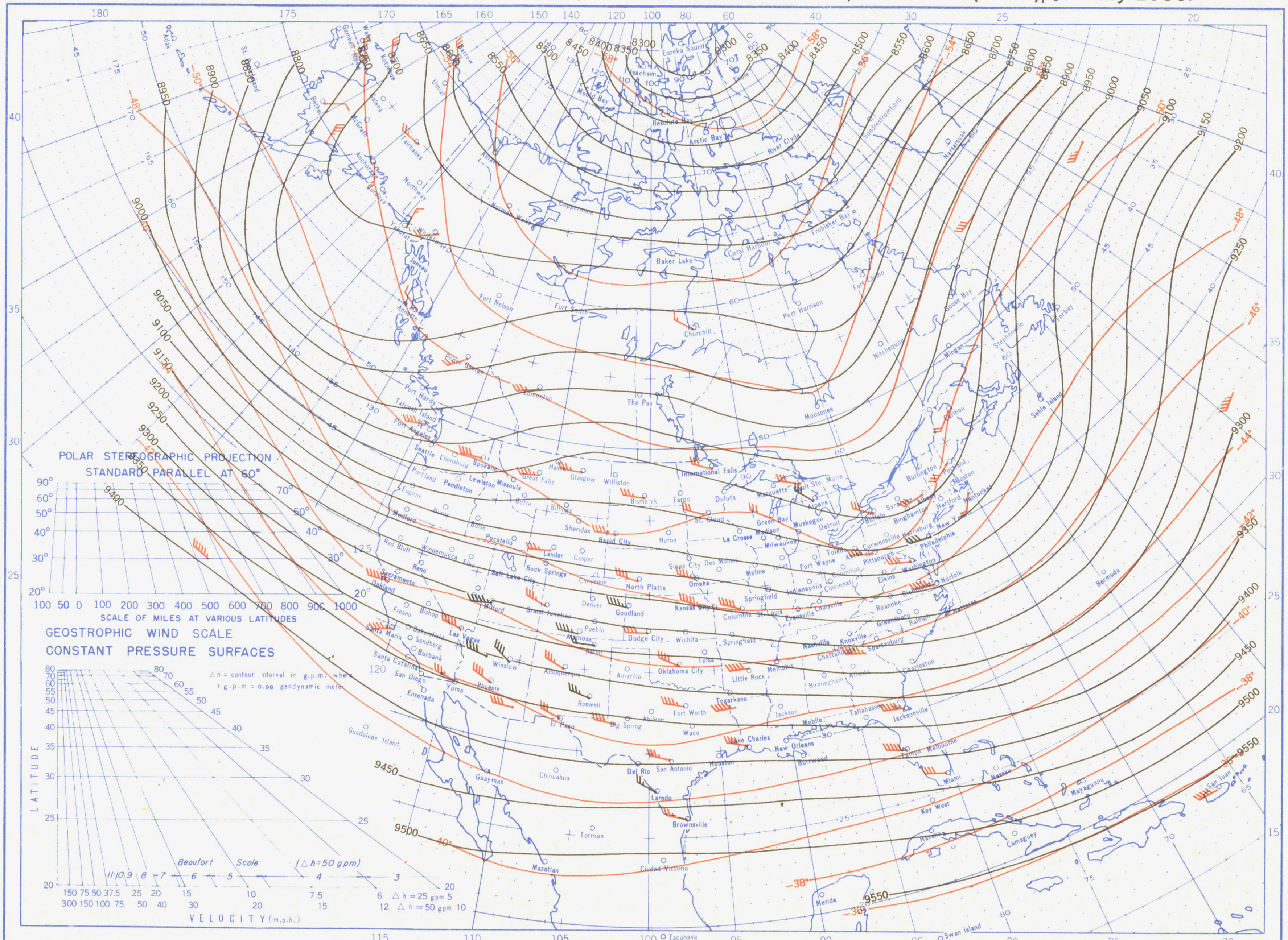
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XIV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 500-mb. Pressure Surface, Average Temperature in °C. at 500 mb., and Resultant Winds at 5000 Meters (m.s.l.), January 1956.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 300-mb. Pressure Surface, Average Temperature in °C. at 300 mb., and Resultant Winds at 10,000 Meters (m.s.l.), January 1956.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.